BLM

Elko Field Office - Nevada

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

South Operations Area Project Amendment Cumulative Effects

AUGUST 2007

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/EK/PL-07/12+1793

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Elko Field Office
3900 East Idaho Street
Elko, Nevada 89801
http://www.nv.blm.gov

TAKE PRIDE IN AMERICA

In Reply Refer To:
1793.7/3809

August 31, 2007

Dear Reader:

Enclosed for your review and comment is the Draft Supplemental Environmental Impact Statement (DSEIS) for Newmont Mining Corporation's South Operations Area Project Amendment (SOAPA). This DSEIS supplements the cumulative effects analysis originally presented in the SOAPA Project 2002 Environmental Impact Statement by providing expanded and updated analyses of cumulative effects consistent with the recent decision by the U.S. Court of Appeals for the Ninth Circuit: Great Basin Mine Watch v. Hankins, 456 F.3d 955, 9th Circuit 2006.

The Record of Decision for the SOAPA Project was signed July 26, 2002, and allowed Newmont to continue and expand gold mining operations on the South Operations Area Project site. Newmont began mining at this location in 1981, and as a result of the 1993 SOAP EIS Record of Decision was allowed to deepen the Gold Quarry open pit mine below the water table which included a dewatering operation. The South Operations is located approximately 6 miles northwest of Carlin, Nevada.

The cumulative effects analyses in this DSEIS incorporate qualitative and quantitative data collected since 2002; expand the analysis of cumulative effects of mining and other land uses where appropriate; and add additional detail with respect to the analytical processes used in the original EIS.

Public comments on the DSEIS will be accepted during a 60-day comment period ending October 31, 2007. Comments on the DEIS should be submitted to: Bureau of Land Management, Elko Field Office, Attention: SOAPA Project SEIS Coordinator, 3900 Idaho St., Elko, NV 89801.

The Final SEIS may be published in an abbreviated format so please retain this draft document for future reference. Your interest in the management of public lands is appreciated. If you have any questions, please contact Deb McFarlane, SOAPA SEIS Project Manager at (775) 753-0200.

Sincerely,

Kenneth E. Miller,
Field Manager

DRAFT
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
SOUTH OPERATIONS AREA PROJECT AMENDMENT
CUMULATIVE EFFECTS

LEAD AGENCY:

U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

PROJECT LOCATION:

Elko and Eureka Counties, Nevada

COMMENTS ON THIS DRAFT SEIS SHOULD BE DIRECTED TO:

Ms. Deb McFarlane
SEIS Project Manager
Elko Field Office
3900 East Idaho Street
Elko, NV 89801

DATE DRAFT SEIS FILED WITH EPA:

August 31, 2007

DATE BY WHICH COMMENTS MUST BE POSTMARKED TO BLM:

October 31, 2007

ABSTRACT

This Draft Supplemental EIS (Draft SEIS) provides additional information regarding cumulative effects associated with gold mining projects located in the central portion of the Carlin Trend, northwest of Carlin, Nevada. This document focuses on the cumulative effects of the South Operations Area Project Amendment (SOAPA) combined with other mining and land use activities within the Carlin Trend area. The SOAPA was authorized in 2002, has been constructed and is currently being operated by Newmont Mining Corporation.

This Draft SEIS supplements the cumulative effects analyses originally presented in the Final SOAPA EIS by providing expanded and updated analyses of cumulative effects consistent with the recent decision by the United States Court of Appeals for the Ninth Circuit in Great Basin Mine Watch v. Hankins, 456 F.3d 955 (9th Cir, 2006).

This analysis tiers to and incorporates by reference the information and analyses contained in the SOAPA EIS. The cumulative effects analyses in this Draft SEIS incorporates qualitative and quantitative data that has been collected since 2002; expanded analyses of cumulative effects of the project combined with other mining and land uses where appropriate; and descriptions of analytical processes used to determine cumulative effects.

Responsible Official for EIS:

Kenneth E. Miller
Manager, Elko Field Office
Bureau of Land Management

DRAFT
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
SOUTH OPERATIONS AREA PROJECT AMENDMENT
CUMULATIVE EFFECTS

Elko and Eureka Counties, Nevada

U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

August 2007

DRAFT
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR
SOUTH OPERATIONS AREA PROJECT AMENDMENT
CUMULATIVE EFFECTS

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CHAPTER 1

INTRODUCTION

The United States (U.S.) Department of Interior, Bureau of Land Management's (BLM) Elko Field Office prepared this Draft Supplemental Environmental Impact Statement (SEIS) for the South Operations Area Project Amendment (SOAPA) to provide additional information regarding cumulative effects associated with the SOAPA Project when combined with past, present, and reasonably foreseeable future land use activities in the Carlin Trend area (**Figure 1-1**). The SOAPA Project was authorized in 2002, has been constructed, and is currently being operated by Newmont Mining Corporation (Newmont).

This Draft SEIS supplements the cumulative effects analyses originally presented in the SOAPA EIS (BLM 2002a) by providing expanded and updated analyses of cumulative effects consistent with the recent decision by the U.S. Court of Appeals for the Ninth Circuit: Great Basin Mine Watch v. Hankins, 456 F.3d 955 (Ninth Circuit 2006).

Descriptions of the SOAPA Project, affected environment, and potential direct and indirect impacts of the SOAPA Project are included in the SOAPA EIS document (BLM 2002a). In addition, the SOAPA EIS provides descriptions of irreversible and irretrievable commitment of resources, residual adverse impacts, and potential mitigation and monitoring measures for the SOAPA Project.

The SOAPA EIS (BLM 2002a) evaluated the Proposed Action (expansion of the Gold Quarry Mine); two alternatives to the Proposed Action: Alternative 1) Backfilling the Mac Pit and, Alternative 2) Modified Waste Rock Disposal Facilities; and the No Action Alternative in detail. BLM evaluated the potential direct, indirect, and cumulative effects of the Proposed Action and alternatives and selected the Proposed Action as the agency-preferred alternative (BLM 2002a). The rationale for BLM's selection of the Preferred Alternative is included in the SOAPA EIS (BLM 2002a). BLM has considered the range of alternatives evaluated in the SOAPA EIS in the cumulative effects analysis included in this Draft SEIS and has determined that neither of the action alternatives would appreciably change the level of cumulative effects within the study areas evaluated in this Draft SEIS.

The cumulative effects analysis in this Draft SEIS incorporates qualitative and quantitative data collected since 2002 and incorporates by reference the information and analyses contained in the SOAPA Project (BLM 2002a) and Leeville Project (BLM 2002b) EIS documents; expanded analyses of cumulative effects of mining and other land uses where appropriate; and additional detail with respect to the analytical processes used. The purpose and need for the action, project history for existing operations (including legal background for the analysis), and issues raised during scoping are discussed in the sections below.

PURPOSE AND NEED

The purpose of Newmont's SOAPA Project is to use the existing work force to conduct mining on unpatented mining claims and fee land within Newmont's South Operations Area to produce gold from ore reserves contained in the ore deposit. Gold is an established commodity with international markets and demand. Uses include jewelry, investments, as a standard for monetary systems, electronics, and other industrial applications.

PROJECT HISTORY AND STATUS

The area of gold mining activity and development in the vicinity of Carlin, Nevada is known as the Carlin Trend. The Carlin Trend is an approximately 50-mile-long, 5-mile-wide belt of multiple major gold deposits extending from approximately 10 miles southeast (Emigrant deposit) to approximately 40 miles northwest (Hollister deposit) of Carlin (**Figure 1-2**).

Although the area has been mined for the past120 years, major mining activity began with development of the Carlin Pit in 1965. As a result of mining since 1965, the Carlin Trend has become the most prolific gold field in the Western Hemisphere.

In March 1997, Newmont submitted to the Elko Field Office of the BLM a proposed Plan Amendment for the South Operations Area Project (SOAP) plan of operations. This project, originally permitted in 1982, is located about 6 miles northwest of Carlin (**Figure 1-2**). The Plan Amendment proposed activities that supported continued operations and expansion of the Gold Quarry open pit mine and ore processing operations at the SOAP site.

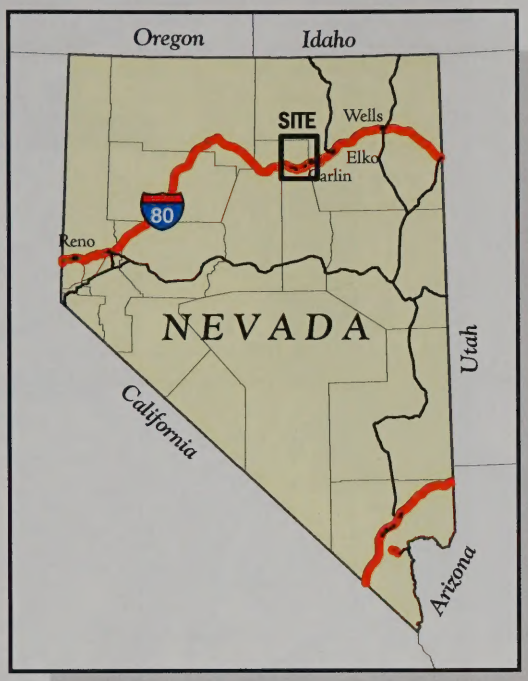
BLM compiled a Draft EIS for SOAPA which was released in September 2000, and a SOAPA Final EIS completed in April 2002 (BLM 2002a). BLM issued a Record of Decision (ROD) for SOAPA in July 2002 that selected an agency-preferred alternative and identified mitigation measures to be implemented for the project. In April 2000, BLM released the Cumulative Impact Analysis (CIA) of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project (BLM 2000). This CIA report analyzed potential effects to surface water and groundwater that could result from dewatering and subsequent discharge of excess water associated with proposed and existing mining projects in the Carlin Trend.

In November 2002, two special interest groups filed an action in U.S. District Court for the District of Nevada challenging BLM's RODs for the SOAPA and Leeville mine projects, as well as BLM's bonding decisions for SOAPA. The groups alleged violations of the National Environmental Policy Act (NEPA), Clean Water Act, and several other legal authorities.

In March 2004, the district court rejected the challenge on cross-motions for summary judgment, and the special interest groups appealed. On August 1, 2006, the U.S. Court of Appeals for the Ninth Circuit concluded that, with the exception of dewatering and discharge of water, BLM's analysis of certain cumulative effects in the Leeville and SOAPA EIS documents did not meet requirements of NEPA (Great Basin Mine Watch v. Hankins, 456 F.3d 955, 9th Circuit 2006). The Ninth Circuit substantially affirmed the district court's decision upholding the SOAPA and Leeville EIS documents in all other respects.

Since BLM's issuance of the SOAPA ROD in 2002, much of the SOAPA Project has been constructed and is being operated by Newmont. Those project components include:

- Deepening Gold Quarry mine pit by approximately 350 feet.
- Installing additional dewatering wells that discharge to Maggie Creek. Dewatering wells remain operational in and near Chukar Gulch. Since 2002, two additional wells have been drilled and one existing well was deepened. One well has been taken out-of-service.
- The Gold Quarry South Waste Rock Disposal Facility has been expanded but has not reached full build-out.
- Ore production from the expanded pit is ongoing. Total tonnage to be produced for the remaining life-of-operations is approximately 118 million tons, of which 57 million tons would be oxide and mill-grade sulfide ore, and the remaining 61 million tons would be low-grade sulfide ore.
- Relocating tailing within the existing footprint of the James Creek Tailing Storage Facility. Construction is in progress and completion is expected in 2008.
- Expanding the West Tailing Dam, including sediment and drainage control, under-drainage pipeline corridor to the existing south under-drain pond.



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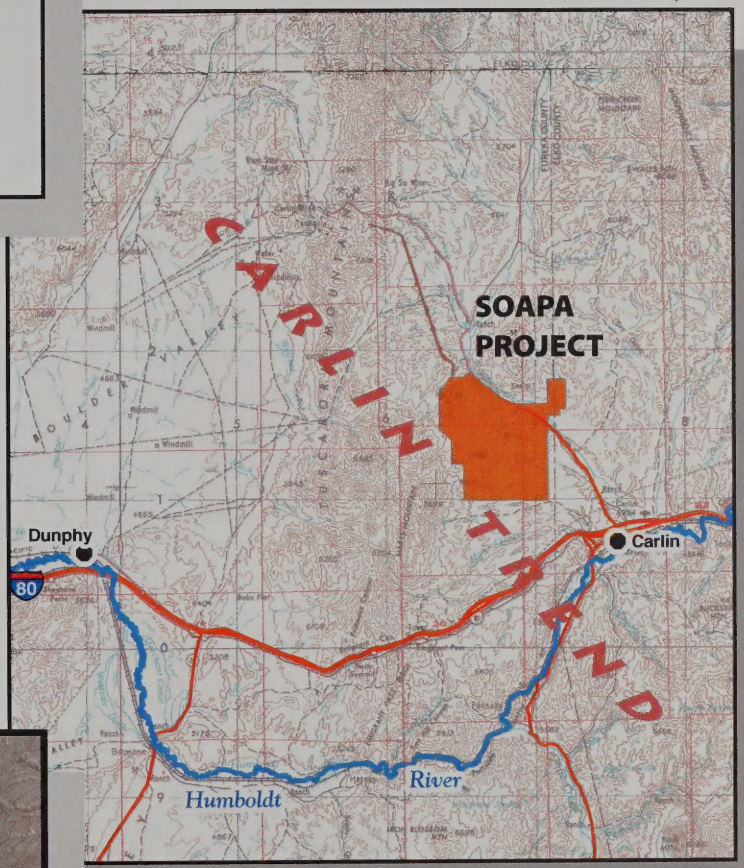

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N
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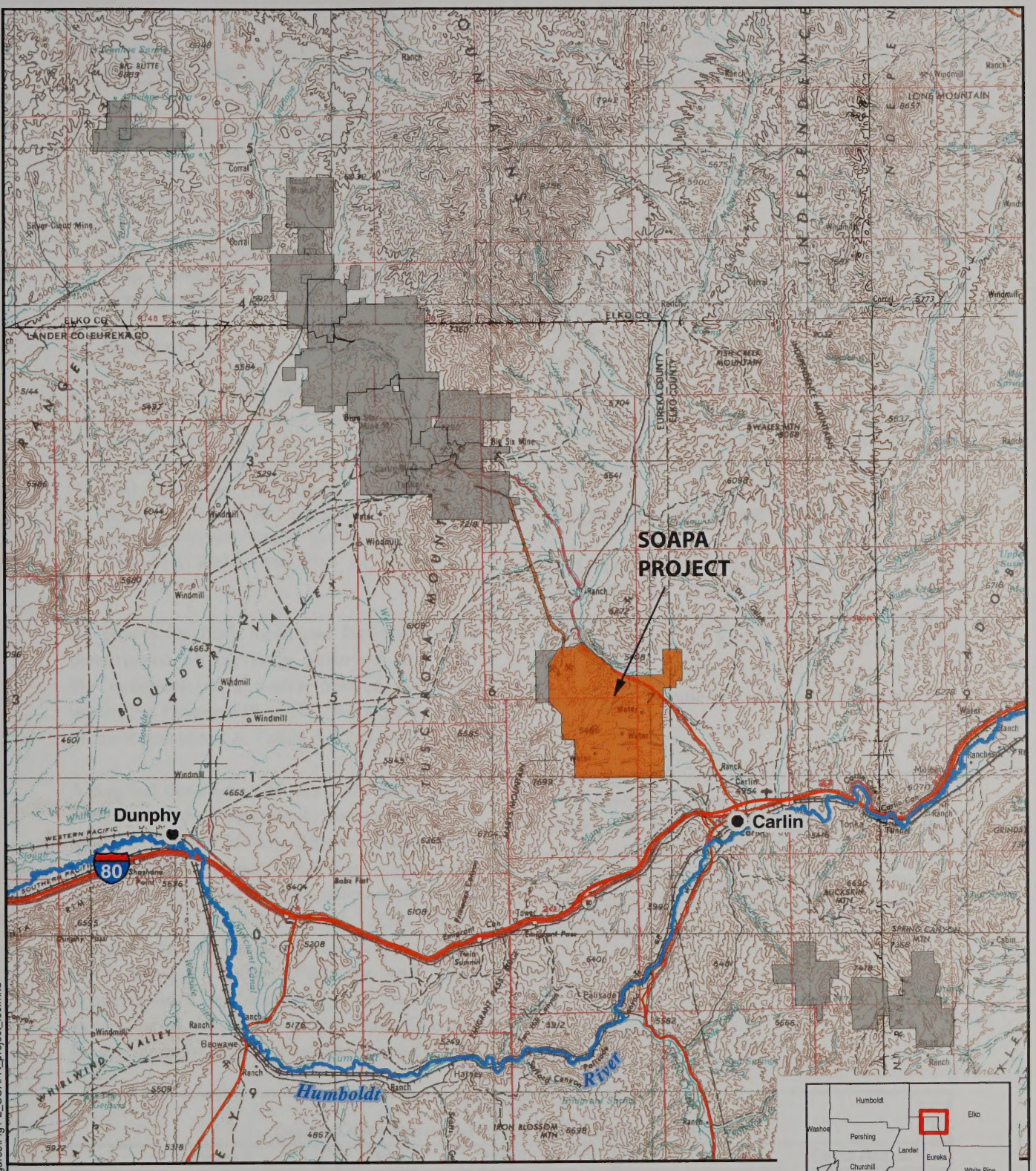
U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

GENERAL LOCATION
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE

1-1

h:\Newmont Leeville-SOAPA SEIS\5000 GIS\Projects\SEIS_Figures\Fig1-1_General Location_Leeville.mxd



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U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

PROJECT LOCATION
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
1-2

- Relocating a portion of the North-South Haul Road.
- Constructing a truck shop and radio tower.
- Constructing a Refractory Leach Facility for heap leaching carbonaceous sulfidic refractory ore.
- Placing topsoil in stockpiles.
- Constructing Phase III of the Property and Phase VI of the Non-Property leach pads during 2006. Remaining phases (Property Phase VI and Non-Property Phases VII and VIII) would be constructed as needed for additional ore as capacity dictates. All expansions will occur on land previously disturbed within the Plan of Operations boundary.

All phases for both leach pad facilities will be constructed on currently disturbed land with the exception of a 6-acre portion contained within the Property Phase IV. Acreage for each phase is presented in **Table 1-1** below:

A detailed description of the SOAPA Project is contained in the Proposed Action section of the SOAPA EIS (BLM 2002a). Other components of the SOAPA Project have not yet been constructed or have been partially completed as of the date of this Draft SEIS. These components include the James Creek Waste Rock Disposal Facility, Property and Non-Property leach pad expansion into Section 18, expansion of the North Waste Rock Disposal Facility, construction of diversion channels (run-on control), and remaining stockpiles for salvaged soil. These facilities are described in the SOAPA EIS (BLM 2002a).

Various amendments have occurred to the SOAPA Plan of Operations since initiation of mining activities. These amendments include eliminating transport of tailing from the James Creek Tailing Storage Facility to the Mill 5/6 Tailing Storage Facility; expanding the Property and Non-Property leach pads; expanding the 5/6 West Tailing Dam; relocating a portion of the North-South Haul Road; and constructing a truck shop and radio tower.

SCOPING SUMMARY

BLM filed a Notice of Intent (NOI) to prepare a Draft SEIS for SOAPA to update cumulative effects analysis. The NOI appeared in the Federal Register on March 7, 2007 (Volume 72, No. 44, page 10241). The NOI announced a 21-day public comment period ending March 29, 2007.

As stated in 40 CFR 1501.7, scoping comments are used to determine the scope and substantive issues to be addressed for the project. **Table 1-2** contains a summary of scoping comments, along with the location in this Draft SEIS where each comment is addressed, if any,

TABLE 1-1
South Operations Area Project Leach Expansions

Leach Pad	Phase	Public Acres	Private Acres	Total Acres
Property	III	0	40	40
Property	VI	0	34	34
Non-Property	VI	3	42	45
Non-Property	VII	1	16	17
Non-Property	VIII	2	23	25
Totals	**All**	**6**	**155**	**161**

Source: Newmont 2007a.

TABLE 1-2
Scoping Summary

Comment	Disposition
All the water of the State belongs to the public and may be appropriated for beneficial use pursuant to the provisions under Chapter 533 and 534 of the Nevada Revised Statutes (NRS). All mineral exploration boreholes must be plugged and abandoned according to the Nevada Administrative Code Chapter 534.	Noted
Use consistent lighting mitigation measures that follow "Dark Sky" lighting practices.	Noted
Use consistent mitigation measures that address logical placement of improvements and use of appropriate screening and structure colors. Existing utility corridors, roads, and areas of disturbed land should be used wherever possible.	Noted
Consider alternatives and mitigation to reduce impacts.	Noted
The Draft Supplemental EIS should focus on the following issues; water resources, surface water quality, waste rock, heaps, pit lakes, air quality, mercury, aquatic habitat and fisheries, and Native American issues.	Cumulative Effects – Chapter 3
For surface water, the whole Humboldt River drainage must be considered. Any salt or metals added to the river will have cumulative impacts with those from other mines, or power plants.	Water Quantity and Quality – Chapter 3
The study area boundaries should be defined for each resource based on the resource and level of disturbance to the resource	Noted
Detail each of the past, present and reasonably foreseeable exploration and development operations.	Past, Present, and Reasonably Foreseeable Future Activities – Chapter 2
Verify the predictions of the drawdown modeling done in 1998 by comparing them to monitoring data collected since. Recalibrate the model if predictions not substantially accurate. Make future predictions after recalibration (if needed).	Water Quantity and Quality – Chapter 3
Update the pit lake models.	Water Quantity and Quality - Chapter 3
Include changes in surface water flow along the Humboldt River in the modeling.	Water Quantity and Quality - Chapter 3
Analyze effects on federal reserved water rights, catalogue each potential affected water right, and the impacts.	Water Quantity and Quality – Chapter 3
Complete a cumulative analysis of waste rock, including an evaluation of potential releases of toxic substances	Geology - Chapter 3
Evaluate acid mine drainage potential using quarterly reporting for water pollution control permits.	Water Quantity and Quality – Chapter 3
Map heaps, including current disposal proposals.	Project Descriptions – Chapter 1
Review all other facilities at mines within the broad cumulative impact review area.	Noted
Map pit lakes. Use the Lone Tree pit lake to verify models. Analyze effects of pit lake water quality on migratory birds and other wildlife, and groundwater.	Water Quantity and Quality – Chapter 3
Review air quality in light of the proposed coal-fired power plant and other sources.	Air Quality – Chapter 3
Analyze releases of mercury from all sources (mines, coal burning, limestone kilns, wildfires, other).	Air Quality – Chapter 3
Study the airshed of northern Nevada, including local and regional impacts.	Air Quality – Chapter 3
Impacts on fish of changes in flows in the Humboldt River system, contaminant loading, and mercury emissions.	Water Quantity and Quality; Air Resources; Aquatic Resources – Chapter 3
Ability of Native Americans to fully practice the traditional religions, including sacred and spiritual sites, and traditional food and medicine gathering.	Native American Religious Concerns – Chapter 3

CHAPTER 2

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIVITIES

This chapter summarizes past, present, and reasonably foreseeable activities in the Carlin Trend. This information forms the basis for discussion of cumulative effects in Chapter 3. Information contained in this chapter includes summaries of changes and/or progress made for activities within the Cumulative Effects Study Area (Study Area) since 2002 – the year that the SOAPA Final EIS document was completed and a Record of Decision (ROD) was issued for the project.

The Council on Environmental Quality (CEQ) defines cumulative impact as:

> "Cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (1508.7).

The geographic area for which past, present, and reasonably foreseeable future activities are described encompasses the Carlin Trend mining complex. The Carlin Trend is a mineralized zone approximately 50-miles-long by 5-miles-wide in north central Nevada where multiple mining operations have been developed. Some activities described in this chapter are located proximal to the mining operations, and other activities are located in adjacent areas (**Figure 2-1**).

Past, present, and reasonably foreseeable land uses (e.g., grazing and recreation), activities (mining), and phenomena (wildfire) cumulatively affect resources to various degrees over a given area. Cumulative effects are discussed on a resource by resource basis in Chapter 3. With the exception of social and economic resources, the past, present, and reasonably foreseeable activities and subsequent cumulative effects to the various resources generally fall within the area shown on **Figure 2-2.** Detailed descriptions and rational used to develop individual resource cumulative effects study areas are provided in Chapter 3.

GRAZING AND AGRICULTURE

PAST and PRESENT ACTIVITIES

Livestock grazing has been and continues to be a co-dominant (with mining) land use in the Carlin Trend area. Multiple grazing allotments have been permitted and administered by BLM over the past several decades. Portions of 13 grazing allotments and/or federal fenced range exist within the Carlin Trend area (**Figure 2-3**). Carrying capacity of the 13 grazing allotments totals approximately114,000 animal unit months (AUMs). Capacity of these allotments has been adjusted over the years in response to mine development, drought, wildfires, and availability of stock water.

Surface water sources that support livestock grazing and agriculture within the area include the Humboldt River, Willow Creek Reservoir, perennial creeks, springs, and seeps. Improved water sources include developed springs, stock wells, stock ponds, water pipelines, and troughs. Livestock will generally congregate near these features. Cow-calf pairs, heifers, steers, and cows graze on residual forage in alfalfa fields, irrigated pastures, and rangeland within the Study Area.

A parcel of private land located in the southern portion of Boulder Valley (TS Ranch) is owned and operated by Elko Land and Livestock Company, a subsidiary of Newmont. In 1990, Barrick Goldstrike Mines, Inc., (Barrick) began dewatering the Betze/Post Mine as it advanced below the groundwater level. Barrick and the TS Ranch entered into an agreement to put mine dewatering water to beneficial use through irrigation (TS Ranch 2007).

In lieu of pumping existing groundwater wells to fulfill water rights owned by Elko Land and Livestock Company for irrigation purposes in Boulder Valley, the State Engineer allowed a "substitution of use" authorizing TS Ranch use of water from Barrick's dewatering wells. The "substitution of use" authorization does not preclude future pumping of groundwater by TS Ranch commensurate with their original water right upon cessation of dewatering operations by Barrick (Pettit 2007).

Barrick began providing water for irrigation on the TS Ranch in the Boulder Valley in 1991 and this irrigation is ongoing today. Water from dewatering of Barrick's Betze/Post Mine and Newmont's Leeville Mine (beginning in 2003) is used for irrigation purposes from April through October annually. Water is used to grow alfalfa hay - a major cash crop for the TS Ranch. Three to four cuttings are harvested annually, with yields averaging 5.2 tons per acre. Top end hay is directed to the California dairy markets, with the balance being sold to neighboring ranchers or consumed by the TS Ranch cow herd (TS Ranch 2007).

Irrigation rates range from an average of 10 pivots applying 5,497 acre-feet (af) of water over an average of 2,670 acres during the 1991 season (April through October) to an average of 53 pivots irrigating 7,936 acres with 23,438 af of water during the 2006 season (April through October) (Newmont 2007b). During the period of November through March of each year all excess water from Barrick's Betze/Post Mine and Newmont's Leeville Mine dewatering operations flow to the TS Ranch Reservoir (Barrick 2007a).

Willow Creek Reservoir is used to support alfalfa and native grass hay production on the Squaw Valley Ranch owned by Barrick Goldstrike (**Figure 2-3**). Information on irrigation rates for this ranch is not available. The ranch also raises cattle.

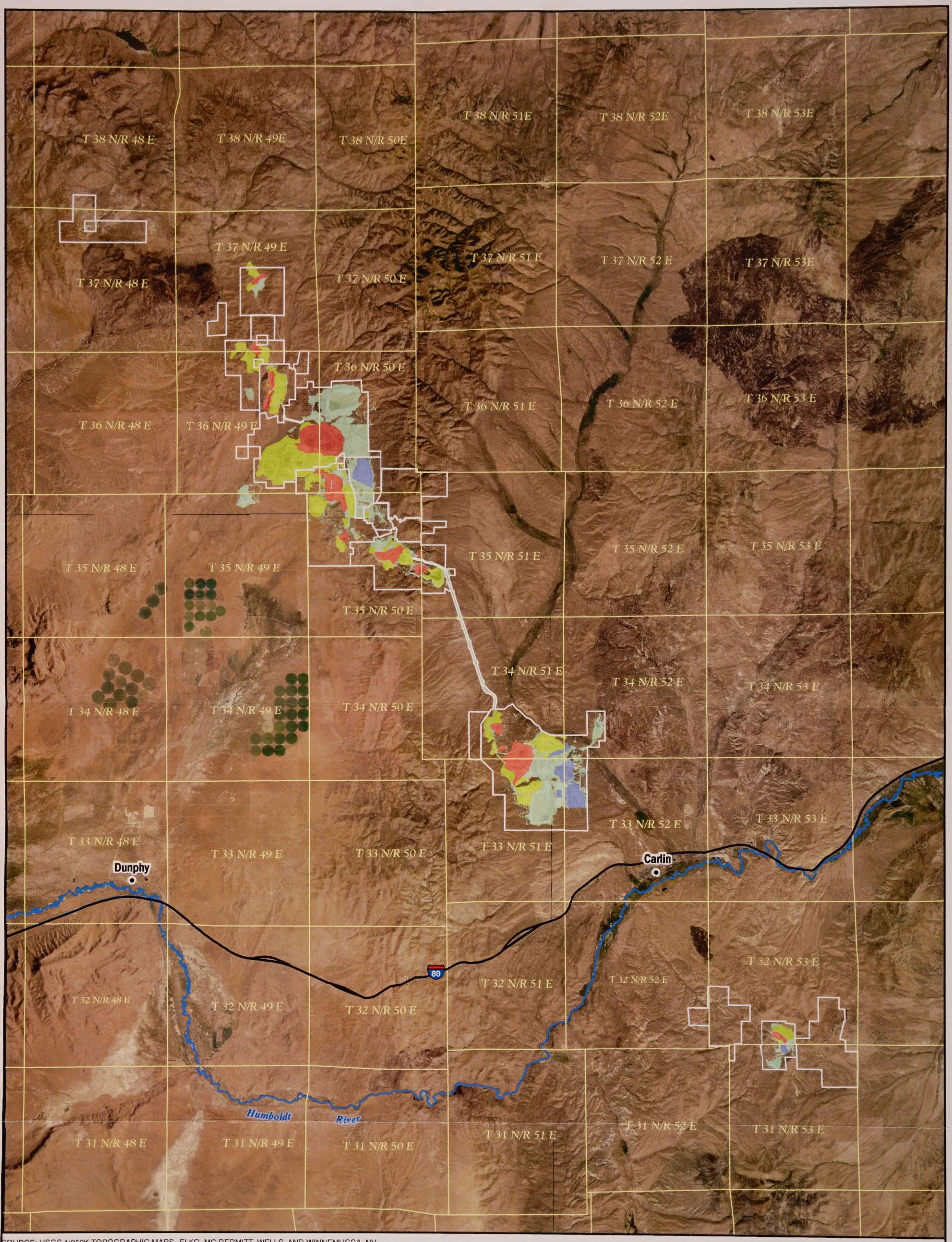
Other private land operations in the study area include the Dean and Sharon Rhoads and Van Norman Ranches Inc. which use surface water sources to support native grass hay production (**Figure 2-3**). These ranches also raise cattle and horses. Information on water sources and rates of irrigation are not available.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Livestock grazing is expected to continue at levels established on the various grazing allotments included in the vicinity of the Carlin Trend. Short-term (typically 2 to 4 years) adjustments to livestock numbers are expected in response to range fires which have impacted forage levels. Livestock water supplies affected by mine dewatering activities would be replaced in accordance with permit conditions for each mining operation.

The following projects are proposed as part of the on-going livestock management program for the BLM Elko Field Office, separate from mining-related activities:

- Boulder Well Pipeline – A pipeline is proposed from the Boulder Well extending into Six Mile Pasture from the Boulder Field. This would help distribute livestock to other portions of the pasture and provide water for wildlife in accordance with the 25 Allotment Management Plan (BLM 2006a).



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

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Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries
- Townships

Mine Disturbance

- Ancillary
- Leach Pad
- Pits
- Waste Rock Dumps

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Elko, Nevada

MINE DISTURBANCE - CARLIN TREND IN NEVADA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-1

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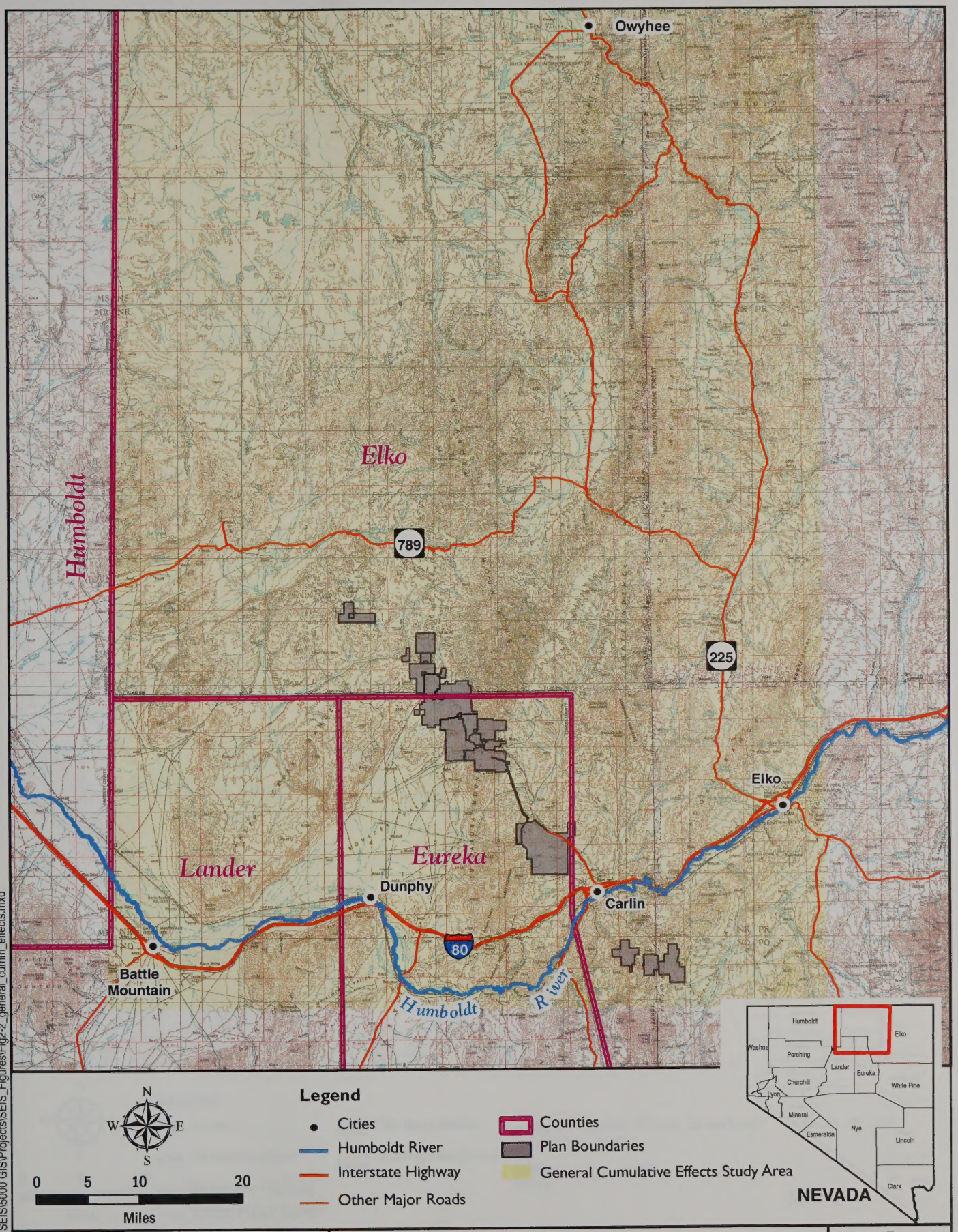

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GENERAL CUMULATIVE EFFECTS AREA
SOAPA Project
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Eureka and Elko Counties, Nevada

FIGURE
2-2

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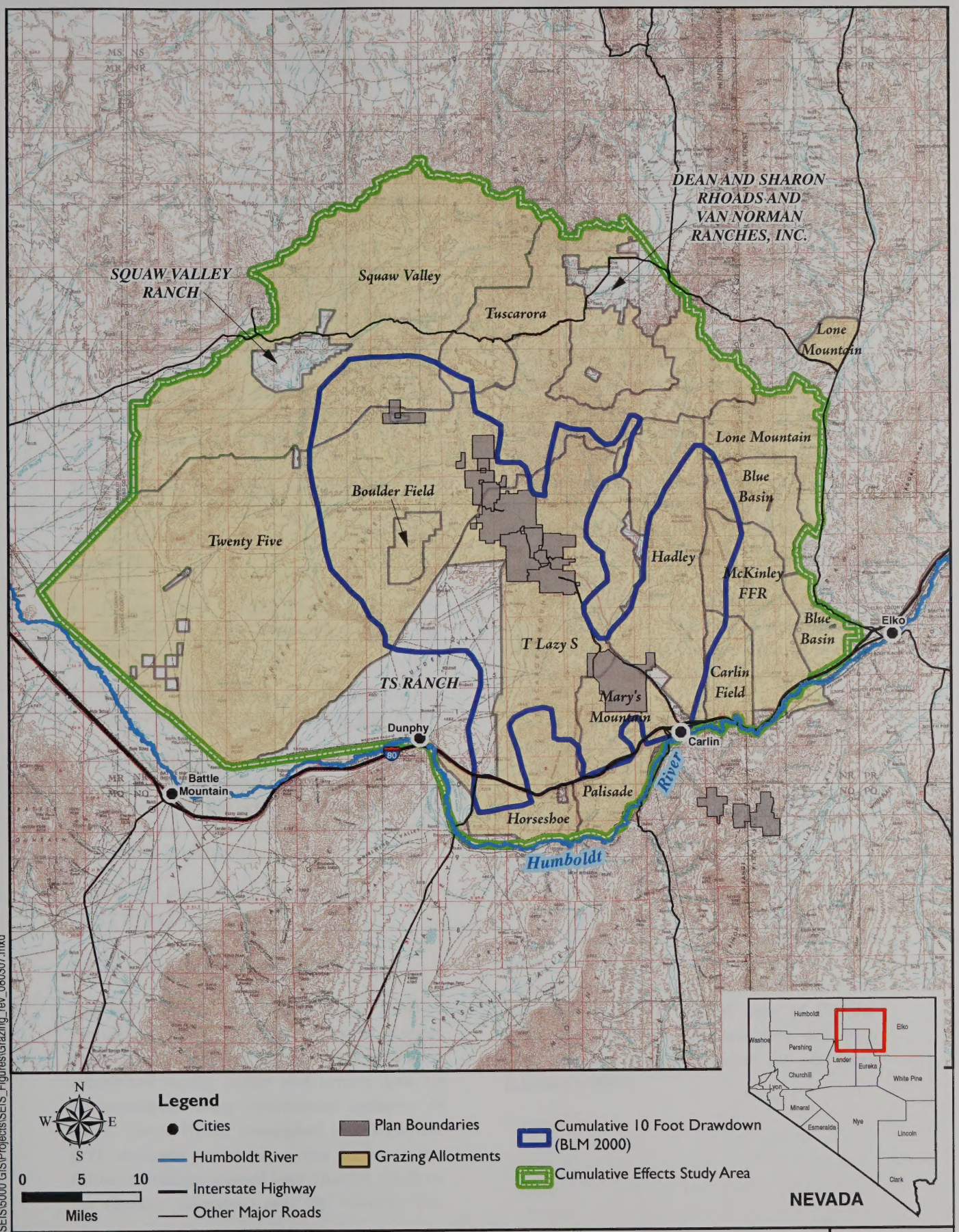

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Elko Field Office
Elko, Nevada

GRAZING ALLOTMENTS
CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-3

- Guard Corral Extension Fence – This project would involve construction of approximately 1 mile of 4-strand fence to divide the Indian Springs and Horseshoe Pastures (BLM 2006a).

- Black Mountain Division Fence – Approximately 3 miles of 3-strand fence would be constructed to divide the Black Mountain and Sheep Creek Areas. The project would provide control and management of livestock to enhance riparian conditions along Rock Creek in the 25 Allotment (BLM 2006a).

The following reasonably foreseeable actions have been identified through current scoping and/or planning to be considered and evaluated (Jewell 2007):

- 10-year Term Grazing Permit Renewal for the Spanish Ranch Allotment (scoping late 2007).

- 10-year Term Grazing Permit Renewal for Squaw Valley Allotment (scoping late 2007).

- 10-year Term Grazing Permit Renewal for all allotments within the Study Area will occur within the project lifetime as permits expire or as the need to fully process permits is identified.

ENERGY PRODUCTION AND DISTRIBUTION

PAST and PRESENT ACTIVITIES

Upgraded power lines have been installed throughout the Carlin Trend area to support ongoing mining activity. Rights-of-way have been established across public and private land to accommodate these distribution systems. In 2004, Sierra Pacific completed a 345-kilovolt (kV) electrical transmission line between the Falcon substation located near Dunphy south to the Gonder substation near Ely, Nevada. The transmission line corridor is near the Carlin Trend area, originating adjacent to Interstate-80 at the town of Dunphy.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

TS Power Plant

The TS Power Plant and construction and installation of power lines connecting to the existing power grid will be completed in the near future. The TS Power Plant is owned by Newmont's wholly-owned subsidiary Newmont Nevada Energy Investment, LLC and will provide electrical power for Newmont's mining and mineral processing operations across northeastern Nevada. The TS Power Plant will be operated and maintained by DTE Energy. The generating capacity will be approximately 200 megawatts; all of which will be sold to Sierra Pacific Power Company. A major portion of the power will be repurchased at or near cost by Newmont for use in its operations.

The TS Power Plant is currently under construction 3 miles north of Dunphy in Eureka County, Nevada. The power plant consists of two coal-fired boilers and four oil turbines, and will require an estimated 1.3 billion gallons of water annually. Assuming a 24-hour power generation cycle, the water demand for the power plant is approximately 2,400 gallons per minute (gpm). The plant will require 50 to 75 permanent employees and has a design life of 50 years. The power plant is expected to be operational in 2008. The TS Power Plant will burn approximately 900,000 tons of Powder River Basin coal annually, averaging one train with 130 cars at 100 tons per car per week (Laybourn 2007).

WILDFIRES AND RESEEDING

PAST and PRESENT ACTIVITIES

Over the last decade, the BLM Elko Field Office averaged 150 fires per season that burned approximately 100,000 acres. Approximately 38 percent (941,793 acres) of wildlife and livestock grazing habitat in the Study Area has been impacted by fire between 1999 and mid-2007. This includes approximately 116,000 acres that burned more than once during the period (BLM 2007a). **Figure 2-4** depicts the cumulative burn areas for the period 1999 to mid- 2007.

Since 1992, public and private entities have worked to restore range habitat for wildlife and livestock on areas affected by wildfire. Restoration work during 2006 by BLM and Nevada Department of Wildlife (NDOW) included fencing burned areas to preclude livestock grazing and reseeding within the Study Area. Some tracts of land are reseeded and others are allowed to reseed naturally (either through recovery of burned plants or under natural release of seeds from adjacent areas). Reseeding efforts are shown on **Figure 2-5**.

Critical habitat areas are being reseeded with forbs, grasses, and shrubs that can compete with invasive grasses such as cheatgrass, which is prevalent in northern Nevada. NDOW is focusing its efforts on areas prioritized for wildlife values. Habitat restoration/reseeding projects from 2000 through 2006 within the Study Area resulted in reseeding a total of 382,787 acres (55,328 acres private and 327,459 acres public).

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Fire (controlled burns and wildfire) will continue to be an important component of land management for public and private landowners. Controlled burns will be used to reduce fuel load in selected areas of public land. Wildfires are expected to continue in the Study Area. Some of this acreage would likely include burning of areas previously burned and seeded.

STABILIZATION AND REHABILITATION PROGRAMS

PAST and PRESENT ACTIVITIES

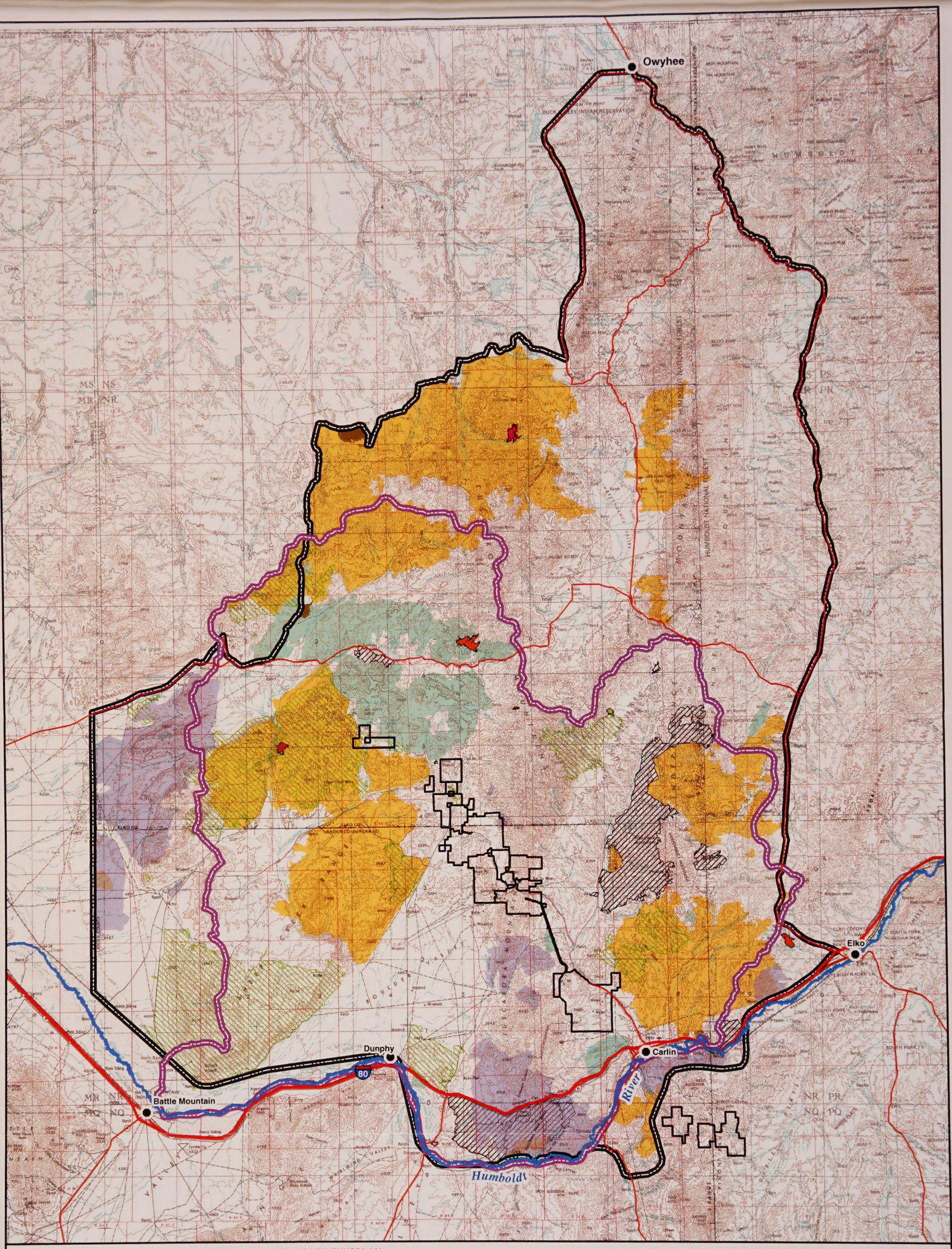
Mitigation Plans

Beginning in 1991, BLM in cooperation with Barrick., Newmont, and others developed comprehensive mitigation plans for mining-related impacts. Many aspects of the mitigation plans are focused in the Carlin Trend and specifically in the Maggie, Willow, and Rock creek drainage basins; however, some mitigation projects have been implemented in other parts of the region. Key aspects of these mitigation plans are summarized below.

Barrick Conservation and Mitigation of Riparian/Wetland Fund – 1991 Betze Project

The Conservation and Mitigation of Riparian/Wetland Areas Fund was established through the ROD for Barrick's 1991 Betze Project (BLM 1991). As stipulated, Barrick contributed $660,000 to an interest bearing account for the protection and enhancement of riparian and wetland areas as compensation for potential loss of up to 330 acres of riparian and wetland area predicted to occur from dewatering operations. The Field (District) Manager for the Elko Field Office approves use of the funds for specific proposals developed by either BLM or Barrick in cooperation with NDOW. As of August, 2007, six projects have been approved or implemented within the Study Area:

- Evaluation of factors affecting Lahontan cutthroat trout recovery in three watersheds;
- Protection of springs and seeps;



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

N
W E
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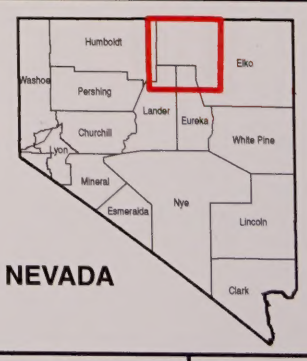
0 2.5 5 10 15
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Special Status Species Cumulative Effects Study Area
- Terrestial Wildlife Cumulative Effects Study Area
- *Plan Boundaries

Fire Years

1999	2004
2000	2005
2001	2006
2002	2007
2003	



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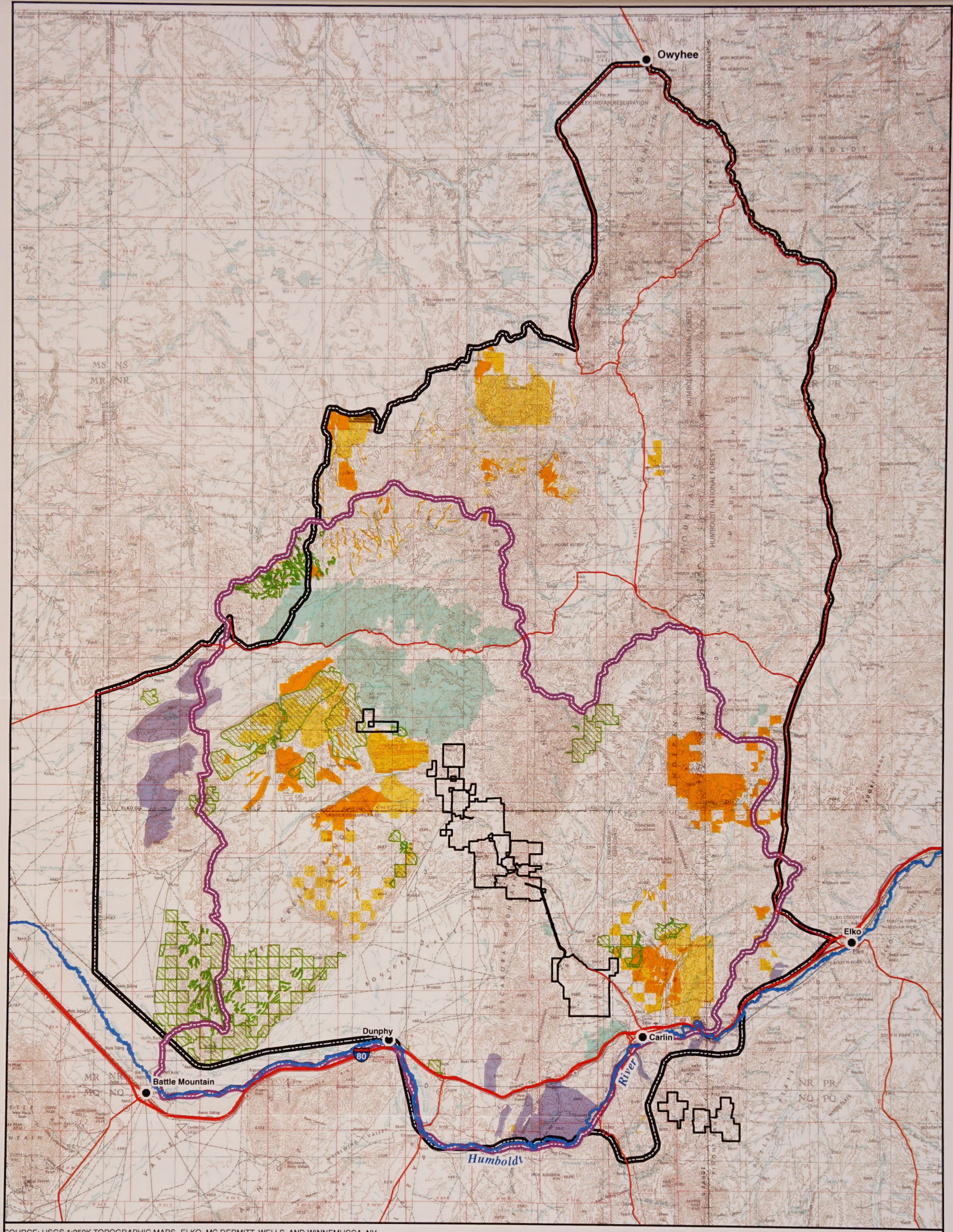
Elko, Nevada

HISTORICAL FIRES - 1999 THROUGH JULY 2007 - CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-4



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

N
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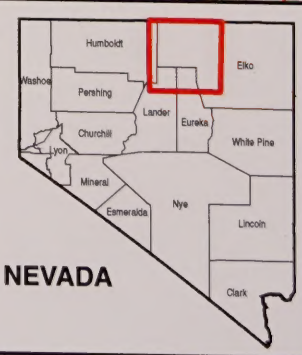
Miles

Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Special Status Species Cumulative Effects Study Area
- Terrestial Wildlife Cumulative Effects Study Area
- Plan Boundaries

Years Reseeded

- 1999
- 2000
- 2001
- 2003
- 2005
- 2006



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Elko, Nevada

RESEEDED AREAS - 1999 TO 2006 - CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-5

- Squaw Valley Allotment Lahontan cutthroat trout habitat management fences;
- Culvert replacement on Beaver Creek for Lahontan cutthroat trout;
- Maggie Creek diversion replacement for Lahontan cutthroat trout; and
- Susie Creek land exchange.

The ROD for the 1991 Betze Project also provided $50,000 for sage grouse habitat improvement projects including protection of riparian areas. To date, $25,000 from this fund has been expended to purchase pipe rail fencing for protection of springs in the Study Area.

Additional projects funded through the 1991 Betze ROD included Mule Deer Habitat Improvement mitigation. Mule Deer Habitat Improvement mitigation funds ($125,000) were used by BLM for seeding projects that included the Northwest Sheep Fuels Treatment Project, Rooster's Comb Seeding, Northwest Izzenhood Seeding, and browse seeding efforts on the Lander Seeding. These areas provide crucial mule deer winter range on the flanks of the Izzenhood and Sheep Creek ranges north of Battle Mountain.

Mitigation Plan for 1993 South Operations Area Project (SOAP)

As part of the 1993 Record of Decision for the South Operations Area Project (BLM 1993), BLM and Newmont developed a comprehensive mitigation plan (Mitigation Plan) for potential resource impacts identified through the EIS process without regard to public or private land status. The intent of the plan was to address potential adverse impacts before they occur and to improve important resources over pre-project baseline conditions.

A primary component of the Mitigation Plan was development of the Maggie Creek Watershed Restoration Project. In 1993, the BLM Elko Field Office, Newmont, and the TS Ranch developed the Maggie Creek Watershed Restoration Project to enhance 82 miles of streams, nearly 2,000 acres of riparian habitat, and 40,000 acres of upland watershed in the Maggie Creek basin. The purpose of this project is to improve priority habitat for Lahontan cutthroat trout populations in the Humboldt River drainage. The project included fencing priority stream and riparian habitats, applying prescription grazing practices, water developments, and establishing a conservation easement. The project also included riparian plantings and comprehensive habitat monitoring.

Detailed discussions of the SOAP Mitigation Plan are contained in the ROD (BLM 1993). Other components of the plan include:

- Reclamation test plots;
- Fencing springs, seeps, stream segments, and livestock grazing pastures;
- Range reseeding projects;
- Stream flow augmentation plans (Maggie and Susie creeks);
- Augmentation of seeps and springs;
- Cultural resource site mitigation;
- Wildlife habitat enhancements;
- Water rights subordination;
- Contributed staff funding; and
- Resource monitoring programs.

Mitigation Plan for 2002 South Operations Area Project Amendment (SOAPA)

The SOAPA Mitigation Plan was developed as part of the 2002 ROD for SOAPA and established additions and revisions to the 1993 SOAP Mitigation Plan. Details of the SOAPA Mitigation Plan are contained in the SOAPA EIS (BLM 2002a). Components of the 2002 SOAPA Mitigation Plan include:

- Sinkhole remediation;
- Installing and monitoring three piezometers;
- Fencing springs and seeps;

- Wildlife enhancement measures;
- Replacing Beaver Creek culvert for Lahontan cutthroat trout;
- Grazing prescription changes;
- Surface and groundwater monitoring programs; and
- Continuing SOAP (1993) Mitigation Plan.

Mitigation Plan for 2002 Leeville Project

The Leeville Mitigation Plan was developed as part of the 2002 Leeville Project ROD, and represents a project specific extension of the 1993 SOAP and 2002 SOAPA Mitigation Plans in addressing dewatering and dewatering related impacts. Many of the mitigation measures for potential loss of surface and groundwater flows are based on monitoring triggers. Details of the Leeville Mitigation Plan are contained in the Leeville Project EIS (BLM 2002b). Primary components of the Mitigation Plan include:

- Standards for construction of waste rock disposal facilities;
- Replacement of Coyote and Little Jack creek culverts for Lahontan cutthroat trout;
- Monitoring plans for refractory ore stockpiles and waste rock disposal facilities;
- Extended conservation easement for Maggie Creek Watershed Restoration Project;
- Minimize stripping operations during bird breeding season; and
- Expanded surface and groundwater monitoring.

Mitigation Plan for 2003 Betze Project

The Betze SEIS Mitigation Plan was developed as part of the ROD for Barrick's Betze Project (BLM 2003). A primary component of the Mitigation Plan was development of the Upper Willow Creek Habitat Enhancement Plan which was designed to provide mitigation for direct, indirect, and cumulative environmental effects analyzed in the Betze SEIS (BLM 2003). The area is located upstream of Willow Creek Reservoir and within the Squaw Valley allotment. The Enhancement Plan was established to restore upland and riparian conditions on approximately 12,300 acres of mostly private land in the upper reaches of the Willow Creek drainage including headwater tributaries of Nelson and Lewis creeks. Components of the Enhancement Plan include:

- Conservation easement for the Upper Willow Creek Habitat Enhancement Plan;
- Spring/seep monitoring;
- Protection and improvement of 15 seeps and springs;
- Funding ($25,000) to U.S. Fish and Wildlife Service for biota in the Humboldt River each year in which a discharge to the river occurs;
- Funding ($50,000) for sage grouse habitat enhancement and pipe rail fencing for spring protection;
- Funding ($50,000) for springsnail relocation study (Desert Research Institute); and
- Conveying 1.5 cubic feet per second (cfs) instream flow right to NDOW and BLM.

Susie Creek Riparian Restoration Project

Susie Creek has been identified as a potential reintroduction site for Lahontan cutthroat trout (USFWS 1995). Beginning in 1991, BLM, in cooperation with Maggie Creek Ranch, fenced approximately 9 miles of the lower reaches of Susie Creek for the purpose of improving stream and riparian habitat through prescriptive livestock management. Approximately 7 miles of additional fencing either has been or is currently being constructed cooperatively by Newmont (under provisions of the 1993 SOAP Mitigation Plan), BLM, U.S. Fish and Wildlife Service (USFWS), and Maggie Creek Ranch to improve an additional 8 miles of Susie Creek on private land. Plans are also in place to fence and manage several miles in the headwater reach in

cooperation with area livestock permitees. Where livestock management programs have been applied, stream and riparian habitat conditions have improved. Between existing and proposed fencing, opportunities exist to restore 20 miles of the Susie Creek drainage on both public and private land.

Other Projects and Programs

In addition to the mitigation plans described above, several projects and programs have been implemented to restore habitat for wildlife and riparian areas and/or manage livestock and wildlife within and adjacent to the Carlin Trend area. Primary programs and projects include the following:

Wildlife

- Mule Deer Transition Range Seeding - In 1997, Newmont, Elko Land and Livestock, NDOW, and BLM completed a Cooperative Agreement that developed and implemented the Bob's Flat Emergency Fire Rehabilitation and Mule Deer Mitigation Reseeding Project. Approximately 3,427 acres were seeded on public land in Bob's Flat and the southern portion of the Tuscarora Mountains through funds provided, in part, by Newmont, and placed in a mule deer habitat mitigation bank for Newmont. Seven Newmont projects totaling 1,790 acres have been withdrawn from the mitigation bank: 800 acres for the South Operations Area Project; 300 acres for the Bootstrap Project; 211 acres for Section 36 Project; 75 acres for the Lantern Project; 139 acres for the South Operations Area Project Amendment, 1-acre for the Leeville Project and 264 acres for the Pete Project. As a result, 1,637 acres remain in the mule deer habitat mitigation bank. Application of these remaining acres would be for future projects resulting in the permanent loss of mule deer habitat for affected herds.

- T Lazy S Sage Grouse Habitat Improvements – Involved prescribed fire manipulation of about 275 acres of Newmont mitigation land (for SOAPA and Pete projects) within the T Lazy S Allotment to improve sage grouse habitat during fall 2005 (BLM 2006a). The same area was later aerially seeded during the winter of 2005 with a multiple grass and forb seed mixture. Newmont has also provided funding for habitat restoration on more than 8,000 acres of sagebrush habitat (Governor's Sage Grouse Conservation Team (GSGCT) 2001).

- BLM completed a 709-acre mule deer habitat improvement project in the Sheep Creek Range north of Battle Mountain in February 2006. The project was funded by Marigold Mining Company (formerly Glamis Dee Gold Mine Company), which provided $25,000 in funds toward the treatment on public land as mitigation for impacts to mule deer and pronghorn antelope habitat.

- Mining companies and NDOW have worked together since 1990 to implement a regulatory program to prevent wildlife mortality at heap leach ponds and mine tailing (e.g., Industrial Artificial Pond Permit program). Industrial Artificial Pond Permits require controls including: fencing to prevent access by terrestrial wildlife; covering/containment for process solution ponds to preclude access by birds and bats; and chemical neutralization or isolation of chemical-laden fluids in a pond too large to cover or contain.

- NDOW is relocating approximately 350 antelope and has held emergency antelope and mule deer hunts to reduce the herds to sustainable levels. Critical areas for affected wildlife are being reseeded with forbs, grasses and shrubs that can compete with invasive grasses such as cheatgrass.

Fisheries and Aquatic Resources

Trout Unlimited Strategies for Restoring Native Trout Program – Maggie and Willow Rock Creek Drainages

In 2001, Trout Unlimited (2007a) introduced the "Strategies for Restoring Native Trout" program to scientifically monitor cooperative, large-scale restoration efforts to improve and expand existing aquatic habitat for native trout. The Maggie and Willow/Rock creek drainages were incorporated into the program in response to large-scale restoration projects being implemented through mine mitigation plans (described above). As part of the work in the Maggie and Willow/Rock creek basins, Trout Unlimited is monitoring Lahontan cutthroat trout populations annually to track progress of restoration efforts including application of prescriptive grazing management and replacement of culvert barriers. Other project partners including BLM, Newmont, Barrick, and NDOW monitor riparian and upland conditions, aquatic habitat, and water quantity and quality.

Open Range Consulting - Evaluation of Factors Affecting Lahontan Cutthroat Trout in Three Watersheds

Since 2006, the BLM Elko Field Office has been working with Open Range Consulting, Inc. and other partners to develop innovative strategies for monitoring and evaluation of mine mitigation restoration efforts in the Maggie and Willow/Rock creek basins. Partners include Newmont, TS Ranch, Barrick, Squaw Valley Ranch, Maggie Creek Ranch, USFWS, Trout Unlimited, and NDOW. Specific goals of the project are to: 1) evaluate effectiveness of large scale watershed restoration efforts for Lahontan cutthroat trout; 2) correlate aerial imagery to field measurements; 3) create software to evaluate and quantify fisheries habitat; and 4) use the information to guide regional trout recovery efforts. Approximate project completion date is 2008.

Beaver Creek Riparian Pasture

The Beaver Creek drainage includes approximately 30 miles of habitat for Lahontan cutthroat trout on both public and private land. In 1992, the Nevada Mining Association, in cooperation with BLM and the 26 Ranch, constructed approximately 4 miles of fence in the headwaters resulting in creation of a 10,000 acre riparian pasture. A combination of rest from livestock and limited hot season grazing since 1993 has resulted in growth and establishment of an aspen/willow riparian corridor and improved habitat for fisheries and aquatic resources.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Fisheries and Aquatic Resources

Programs to improve stream and riparian habitat through improved livestock grazing management practices are expected to increase in the Study Area. These programs are expected to result in improvements to fisheries and aquatic resources, including threatened, endangered, and candidate species.

Wetlands and Riparian Areas

Restoration of riparian areas and programs to increase habitat for mule deer, sage grouse, and other wildlife are expected to continue in the future. Many of these programs are implemented by mining companies to offset losses of habitat that could occur as a result of operations and+ mine development. Other programs are implemented to restore vegetation and habitat in areas impacted by fire.

The Barrick 15 Spring Improvements project was identified as part of Barrick's mitigation commitment in the 2003 Betze Project SEIS and would restore up to 15 spring riparian sites by constructing protective fencing around seeps and springs (BLM 2006a).

RECREATION

PAST and PRESENT ACTIVITIES

Outdoor recreational areas and facilities in the vicinity of the Carlin Trend include those managed by BLM, Nevada Division of State Parks, U.S. Forest Service (USFS; Humboldt-Toiyabe National Forest), USFWS, Bureau of Indian Affairs (BIA), and private operators. These areas and facilities are described in the SOAPA EIS (BLM 2002a) and shown on **Figure 2-6**.

Public land within these areas provide diverse recreational activities, including fishing, sightseeing, hunting, cross-country skiing, horseback riding, white-water rafting, photography, rock-hounding, and off-highway vehicle use. The majority of public land in the Carlin Trend has been designated as "open" for off-highway vehicles.

Recreational use of public land in the vicinity of mining operations in the Carlin Trend consists primarily of off-highway vehicle use and hunting. The area is hunted for deer, antelope, and upland game birds.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

The two primary recreational activities occurring in the vicinity of Carlin Trend are off-highway vehicle use and hunting. These activities would likely continue at current levels through the foreseeable future.

BLM is currently building a California trail interpretive center located at the Hunter exit on Interstate 80, about 6 miles west of Elko. The center will encompass 40 acres and include a building, access road, interpretive plaza, 65-car parking lot, 1.5-mile walking trail, amphitheater, and day use area. Estimated completion date is March 2008. BLM estimates approximately 65,000 people/year will visit the center once all exhibits are in place by 2010 (Jamiel 2007).

LAND DEVELOPMENT

PAST and PRESENT ACTIVITIES

Approximately 565 acres have been platted for development in the vicinity of Carlin. The majority of platted area lies between Interstate 80 and the Humboldt River in and adjoining the town of Carlin. Other development is occurring east of Highway 766 near its intersection with Interstate 80 (Newmont 2007c).

Approximately 23 acres have been platted at Palisades, midway between Carlin and Dunphy. Development in the Dunphy area consists of approximately 6 acres (Newmont 2007c). Information concerning the level and stages of these developments is not available.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Land development in the Carlin-Dunphy area would likely continue commensurate with population and employment increases in the area.

MINE AND MINERAL DEVELOPMENT

PAST and PRESENT ACTIVITIES

Dewatering and Discharge

Maggie Creek Basin

Newmont's South Operations Area Project is the only mining operation with dewatering and discharge activities in the Maggie Creek Basin. The Gold Quarry Mine currently pumps water at a rate of about 14,000 gpm or 22,500 acre-feet per year (af/yr). Of this amount, approximately 5,000 af/yr are used in mine operations (e.g., makeup water in ore processing or dust control); 200 af/yr are pumped to Maggie Creek Reservoir for storage during times of high runoff in Maggie Creek; 8,400 af/yr are used to irrigate the Hadley Fields west of lower Maggie Creek during the growing season; and 8,900 af/yr are discharged directly to Maggie Creek. Newmont has implemented the Maggie Creek Basin Monitoring Plan to monitor effects of dewatering at Gold Quarry on surface water and groundwater (Newmont 2007d).

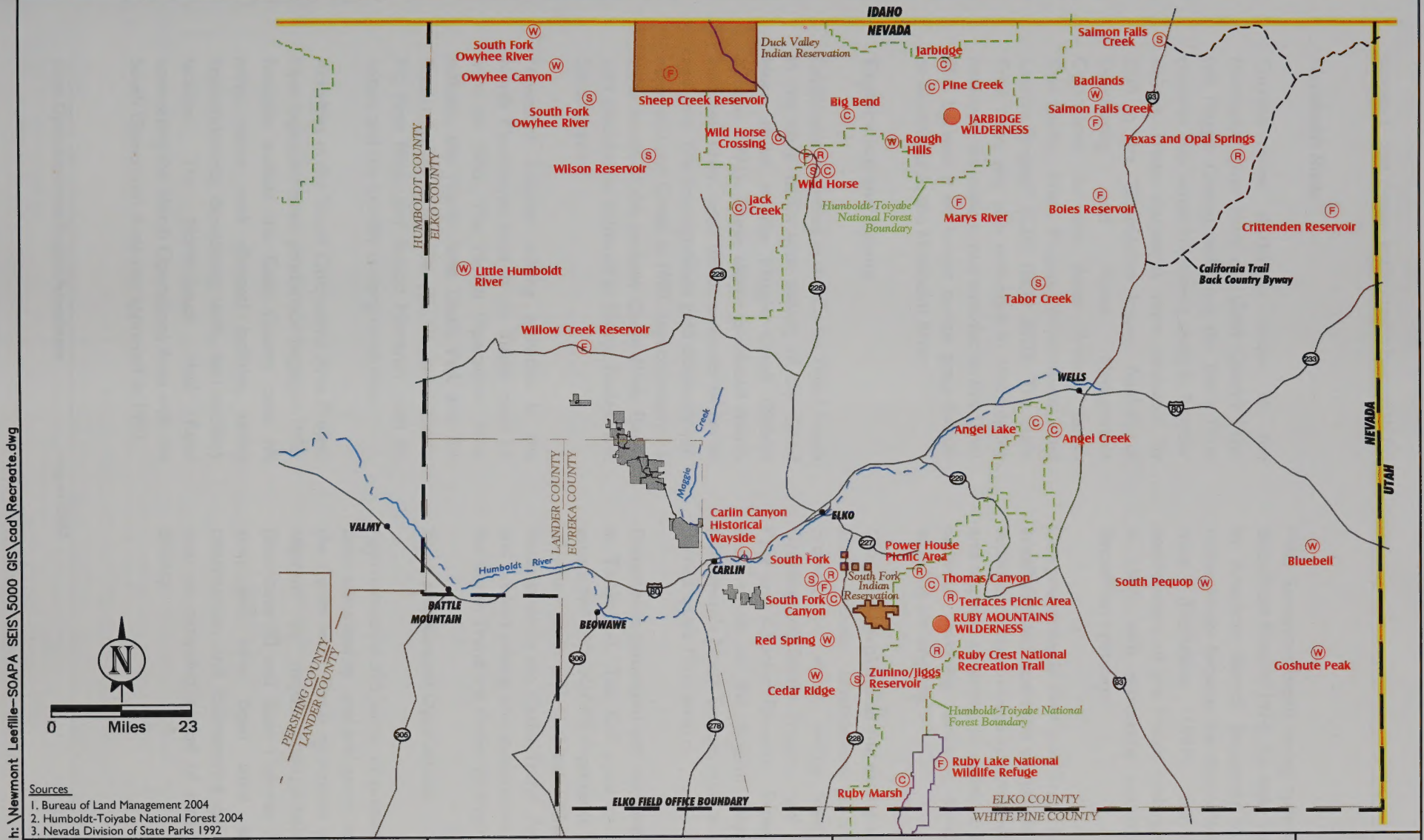
In November 1993, BLM adopted the SOAP Mitigation Plan (BLM 1993). Measures included in the SOAP Mitigation Plan and subsequent revisions to the Mitigation Plan for SOAPA (BLM 2002a) address potential adverse impacts from dewatering without regard to whether they occur on public or private land. Measures in the Mitigation Plan that deal directly with dewatering include groundwater monitoring and reporting protocols. Monitoring data are used to trigger implementation of mitigation measures found in the Mitigation Plan, including flow augmentation for individual springs, seeps, and streams.

Boulder Valley

Dewatering at Barrick's Betze/Post pit and underground Meikle Mine averages approximately 20,000 gpm or 32,200 af/yr. Water not used for mine operations is conveyed to the TS Ranch Reservoir, Boulder Valley irrigation projects, Boulder Valley reinjection system, Sand Dune drainage and evaporation network, and/or discharged to the Humboldt River (Barrick 2006a).

Newmont's Leeville Project was approved in 2002 to develop an underground mine and associated mine dewatering system (18-year projected life). Dewatering rates in 2006 averaged about 17,000 gpm or 27,400 af/yr, of which 1,200 af/yr are used for mine operations and the remainder discharged to the TS Ranch Reservoir and Boulder Valley irrigation projects (Newmont 2006).

In 2005, Hecla Mining Company was permitted to construct and dewater an underground decline at the Hollister Development Block Exploration Project, located at the northernmost end of the Carlin Trend within Boulder Valley. Great Basin Gold currently operates the Hollister Development Block exploration project. Groundwater entering the exploration decline is pumped from mine sumps to the surface and discharged into a primary water management recycle pond with a capacity of 1.4 million gallons. The recycle pond is used for storing decline water for reuse in the underground drilling program, underground dust suppression, and for fire protection. Excess water, beyond the working capacity of the surge pond and project water needs, is pumped via a pipeline to a holding tank and two rapid infiltration basins located on an alluvial terrace near the confluence of Little Antelope Creek and Antelope Creek, approximately 5 miles from the portal. Dewatering associated with the exploration decline development averaged 350 gpm during 2006.



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Sources
1. Bureau of Land Management 2004
2. Humboldt-Toiyabe National Forest 2004
3. Nevada Division of State Parks 1992

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Elko Field Office
Elko, Nevada

- Interpretive Site
- Campground
- Fishing Area
- Recreation Area
- Special Recreation Management Area
- Plan Boundaries
- Wilderness Study Area
- Wilderness Area

RECREATION AREAS
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-6

Humboldt River

Current mine discharges occur to the Humboldt River from the Gold Quarry Mine (via Maggie Creek) and from the Betze Mine complex (via water treatment plant in Boulder Valley). These discharges were evaluated by BLM in the "Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project" (CIA) (BLM 2000). The Lone Tree Mine was also evaluated in that report; however, the mine is not included in this Draft SEIS because it no longer pumps groundwater or discharges to the Humboldt River.

Exploration and Mining

Exploration activities in the Carlin Trend began in the early 1870s with staking of the Good Hope claims in the Maggie Creek District (Coope 1991). These claims produced mainly lead and silver, with minor amounts of barite and gold. The first significant gold discovery was made on Lynn Creek in 1907, approximately 1.5 miles north of the present Carlin Mine. Placer gold discoveries followed in Sheep, Rodeo, and Simon creeks.

Newmont initiated mining activities in the North Operations Area at the Carlin open pit mine in 1965. The North Operations Area includes the North Area Leach Pad, and the Bootstrap, Blue Star/Genesis, Lantern, Carlin Pit, Pete Mine, and Bullion Monarch open pit mines, and the Leeville underground mine.

Activities in the South Operations Area Project have expanded since production began in 1985. Facilities include the Gold Quarry open pit mine, waste rock disposal facilities, tailing impoundments, dewatering wells, and ancillary facilities. The North-South Haul Road connecting the North Operations Area with the South Operations Area was approved in 1993.

Polar Resources began mining operations at the Betze/Post Mine in 1974; the mine was acquired by American Barrick Resources in 1986 and subsequently became the Betze/Post open pit mine (McFarlane 1991). Barrick began development of the Meikle underground mine in 1995, with processing occurring at the Betze/Post operation.

Ore processing in the Carlin Trend has included installation and operation of cyanide heap leach facilities, carbon-in-leach systems, milling of ore, and disposal of tailing. In addition, exploration projects involving drilling, trenching, and sampling are ongoing.

Changes in exploration and mining activity since 2002 include advancement of exploration projects to active mining level (Barrick's Goldbug and Storm Projects, and Newmont's Pete and Chuckar Projects). Expansions have been made to the Known Deposit Areas (Newmont's North Lantern and Lantern #3 and Barrick's Dee Mine area).

Disturbance associated with each mine is shown in **Table 2-1**. The 839 acres of disturbance associated with SOAPA represents 2.5 percent of the past and present mining related disturbance in the Carlin Trend. Areas of past and present mining and exploration activities in the Carlin Trend are shown on **Figure 2-7**.

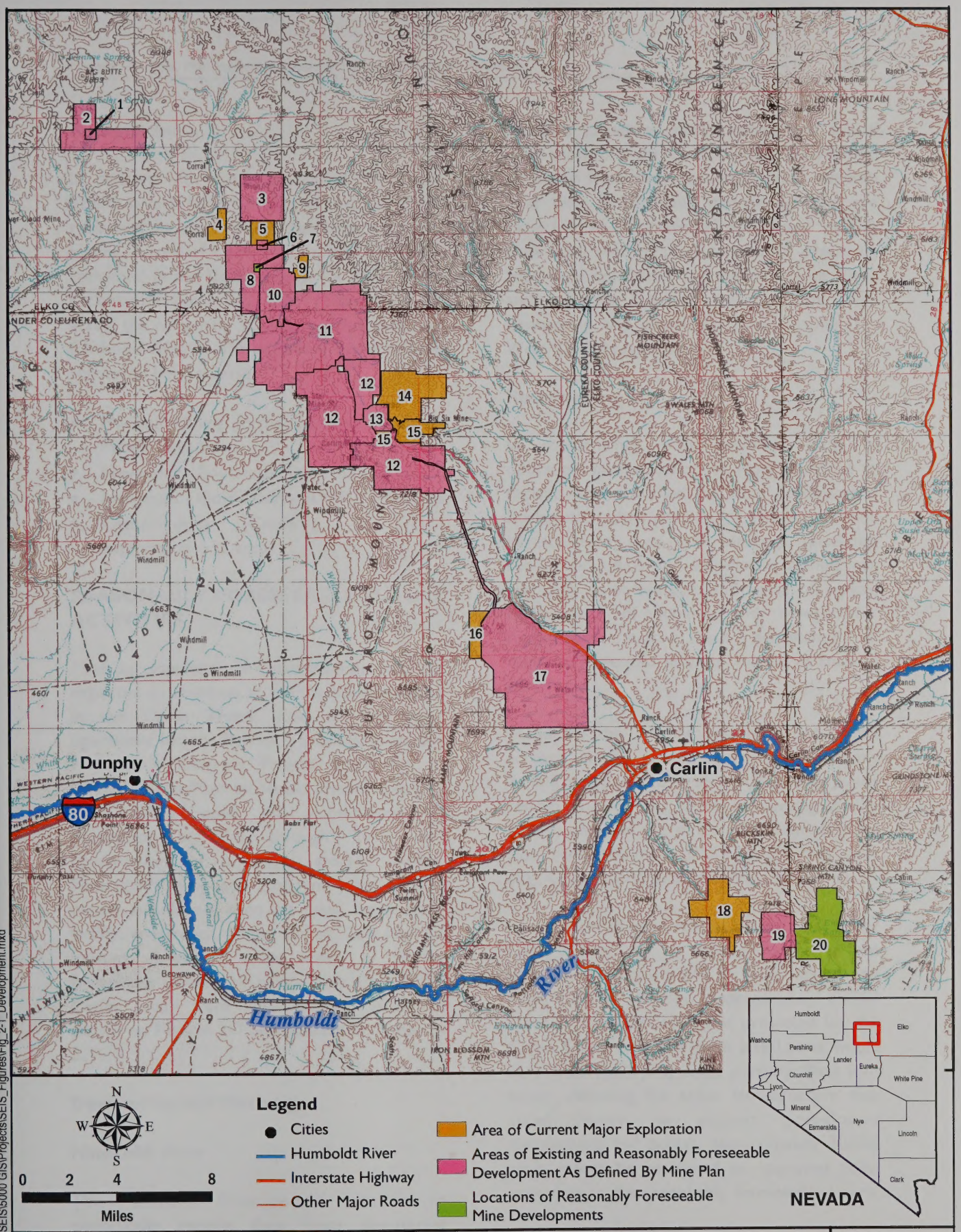
Sand and Gravel Operations

Approximately 395 acres of private land have been disturbed by sand and gravel operations in the Carlin area. These operations generally lie adjacent to major transportation routes (Interstate 80 and State Highway 766) in the area and have been used to support construction and maintenance of area roads over an extended period of time (Newmont 2007c).

TABLE 2-1
Past and Present Mining and Exploration Related Disturbance[1]
Carlin Trend

Map Reference No.[2]	Facility	Existing Disturbance (acres)		
		Pre – 2002	2002 - 2007	Total
Mining Operations				
1	Newmont/Great Basin Gold-Hollister/Ivanhoe	268	0	268
3	Halliburton-Rossi	283	125	408
6	Barrick-Storm Underground	-	185	185
8	Marigold – Dee Mine	1,314	1	1,315
10	Newmont-Bootstrap	1,900	-	1,900
11	Barrick-Betze/Post , Meikle, Rodeo,Goldbug, (Mill & TSF transferred from Newmont)	8,255	986	9,241
12	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch	1,775	1,022	2,797
	Newmont-North Area Leach	494	932	1,426
	Newmont-Carlin Mine/Mill 1, Pete	1,598	2,075	3,673
13	Newmont- Leeville	-	566	566
17	Newmont- Gold Quarry/SOAP, MC Reservoir, N-S Haul Road	8,641	1,320	9,961
19	Newmont-Rain	954	7	961
Subtotal		**25,544**	**7,219**	**32,701**
Exploration				
1	Great Basin Gold- Ivanhoe	15	-	15
2	Hecla- Hollister Development Block	-	51	51
4	Trio Gold Corp-Rodeo Creek	-	42	42
5	Barrick-Meridian JV-Rossi	51	-	51
9	Centerra -Ren	30	-	30
11	Barrick-Goldstrike Project	233	-	233
12	Newmont -Carlin	255	-	255
14	Newmont- Chevas	168	-	168
15	Newmont-High Desert	164	-	164
16	Newmont -Mike	48	-	48
18	Newmont- Woodruff Creek	66	-	66
20	Newmont-Emigrant Springs	63	-	63
Subtotal		**1,093**	**93**	**1,186**
TOTAL		**26,637**	**7,312**	**33,887**

[1] Projects permitted by BLM as of April 2007.
[2] See **Figure 2-7** for disturbance sites.
Source: BLM 2007b.



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PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE MINING ACTIVITIES - CARLIN TREND IN NEVADA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-7

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Reclamation

In concert with mining activity in the Carlin Trend, several hundred acres of land have been reclaimed in response to cessation of active mining. A total of 1,676 acres of land have been reclaimed in the Carlin Trend. Of these acres, reclamation bond has been released on 62 acres; the remaining acreage is pending review for bond release. The following projects have requested bond release:

- Marigold Mining (formerly Glamis Dee Gold Mine) – 512 acres
- Newmont - Bootstrap Mine – 895 acres
- Newmont - Gold Quarry SOAP – 192 acres
- Centerra-Ren (Centerra US, Inc.) exploration – 15 acres

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Mine development and exploration projects are expected to continue in the foreseeable future in the Carlin Trend. Two of the larger operations include Barrick's Betze/Post pit and Newmont's Emigrant Project. Expansion of Barrick's Betze/Post pit would involve enlarging the existing open pit, continuation of dewatering activities through 2015, and construction of a tailing storage facility. Newmont's proposed Emigrant Mine Project would include an open pit mine, heap leach facility, waste rock dumps, and ancillary facilities located about 20 miles south of Carlin. Reasonably foreseeable mining operations in the Carlin Trend from 2007 through 2020 are shown on **Figure 2-7** and detailed in **Table 2-2.**

Dewatering and Discharge

Humboldt River

The Humboldt River would continue to periodically receive flow from dewatering activities associated with ongoing and future mine projects in the Carlin Trend. Contribution of water from these sources would diminish over time as projected dewatering rates are expected to decrease. Groundwater models have been used to predict potential effects on base flow conditions for the Humboldt River and tributary streams resulting from mine dewatering and discharging (see Chapter 3 - *Water Quantity and Quality*).

Reclamation

In conformance with approved plans of operation, mining operations would continue to reclaim land disturbed for mine development. Reclamation plans provide for removal of mine infrastructure (i.e., mill buildings, pipelines, roads, and office and warehouse complexes); regrading spent ore piles and waste rock piles; replacement of topsoil; and revegetation. Reclamation must meet acceptance of regulatory agencies prior to release of financial assurances.

Based on the current approved disturbance acreage in the Carlin Trend (approximately 34,000 acres), approximately 6,500 acres would remain as open pits. Once dewatering activity ceases, some of the pits would form pit lakes from reestablishment of the groundwater table (e.g., Gold Quarry and Betze/Post mine pits).

Reclamation of mine related disturbances in the Carlin Trend will be incremental as various operations reach the end of active mining and begin closure activities. Approximately 38,000 acres of mine disturbance is projected for the Carlin Trend, of which about 6,500 acres would remain as open pits; some partially filled with water. Allowing for some infrastructure that could remain to support post-closure maintenance and access, approximately 30,000 acres would be reclaimed to approved post-mine uses in the reasonably foreseeable future.

TABLE 2-2
Reasonably Foreseeable Mine Development
Carlin Trend
2007 – 2020

Map Reference	Facility	Estimated Disturbance (acres)	Comment
1	Great Basin Gold-Ivanhoe	100	Foreseeable underground gold mine and facilities. Same location as the Hollister Development Block Project. Hollister Development Block Project would go from underground exploration to underground mining operation.
3	Halliburton-Rossi Mine	200	Rossi mine expansion of Queen Lode and Sage Hen areas and may include expansion of open pits and waste rock dumps.
		100	Increase acreage for surface exploration.
7	Barrick-Arturo	100	Foreseeable future open pit gold mine. Development of a new open pit mine at the existing Dee Gold Mine.
9	Centerra-Ren	100	Foreseeable underground mine.
11	Barrick-Betze/Post	1,558	Mine expansion. Expansion includes enlargement of open pit and construction of tailing impoundment.
12	Newmont-North Area Leach Facility	100	Reasonably foreseeable future activities include the expansion of the heap leach pad.
	Newmont-North Lantern #3	100	Foreseeable future open pit gold mine. Expansion of the Lantern Mine at the Blue Star-Genesis Plan.
	Newmont-Genesis Project	37	Continued mining of the Genesis Area. Project includes open pit mining, sequential backfill and increased height of existing external waste rock facilities.
16	Newmont-Mike	100	Foreseeable future gold mine project.
17	Newmont-South Waste Rock Disposal Facility	100	Expansion of Non-property Leach Pad and construction of Property Pad 2 in Section 18.
20	Newmont-Emigrant	1,603	Proposed open pit mine, sequential backfilling, heap leach pad facility and waste rock dump; permitting in progress.
TOTAL		**4,161**	

* Reasonably foreseeable assumes 100 acres disturbance per plan or plan amendment. Actual disturbance will vary as plans are developed.
Source: BLM 2007b.

Reclamation involves use of an approved seed mix that includes native and introduced species of grasses, forbs, and shrubs to establish sustainable vegetative communities beneficial to livestock grazing and wildlife habitat.

HAZARDOUS /SOLID WASTE AND HAZARDOUS MATERIALS

PAST and PRESENT ACTIVITIES

Hazardous Waste

SOAPA and Barrick/Betze currently operate as Large Quantity Generators of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). These facilities generate more than 1,000 kilograms per month of RCRA-regulated hazardous waste (40 CFR Part 260-270). All hazardous wastes currently generated at the mines are managed according to existing, approved permits or are disposed of according to local, state, or federal regulations.

Hazardous waste streams associated with mining and ore processing in the Carlin Trend are shown in **Table 2-3**. These wastes are accumulated and stored at designated sites at each mine operation and periodically transported to one of two Clean Harbors Treatment, Storage, and Disposal (TSD) facilities in Utah. All hazardous wastes are stored, packaged, and manifested in compliance with applicable federal and state regulations.

Solid Waste

All non-hazardous solid waste generated through operations in the Carlin Trend is disposed in NDEP approved Class III waivered landfills established at the mine sites.

Hazardous Materials

A compilation of hazardous materials stored in the Carlin Trend was obtained from the Nevada Fire Marshall's office and is contained in **Appendix A**. The records included in **Appendix A** are for individual facilities in the Carlin Trend and represent the annual maximum volume of these materials that are to be stored. Hazardous materials used and stored on-site in the Carlin trend are shown in **Table 2-4**.

Toxic Release Inventory

On May 1, 1997, The U.S. Environmental Protection Agency (EPA) promulgated a final rule (62 FR 23834) that added several industries to the list of facilities subject to reporting under Section 313 of the Emergency Planning and Community Right-To-Know Act, including most metal mining facilities. The Emergency Planning and Community Right-To-Know Act 313 program is commonly referred to as the Toxic Release Inventory program. Starting with the 1998 calendar year, metal mining facilities were required to report releases and other waste management activities involving a specific list of chemicals and compounds of those chemicals.

The information presented in **Tables B-1, B-2**, and **B-3** contained in **Appendix B** are a compilation of data available in Facility Profile Reports on the EPA website http://www.epa.gov/cgi-bin for Barrick's Betze/Post Mine and Newmont's North and South Area Operations. The amounts of individual chemicals in each column represent the cumulative amount of chemical release or other handling activities reported by each facility from 1998 to 2005. Reporting year 2006 data are not yet available. The first column of each table identifies the chemical name or compound reported. The second, third and fourth columns detail release amounts to air, surface water, and land, respectively. The fifth column provides a total of release amounts. If a portion of the chemical was recycled or transferred off site for disposal, that volume of disposal would appear in column six, and totals of all on- and off-site releases including disposal

TABLE 2-3
Hazardous Waste Stream
Carlin Trend Operations

Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
Newmont Operations				
Paint-related material	Mill 6	D001, F003	Clean Harbors by Incineration	1,100 gals
Mercury PPE/debris	Mill 6	D009	Clean Harbors by HW Landfill	31,600 lbs
Spent MIBK	Assay Lab.	D001, D002	Clean Harbors by Incineration	350 lbs
Mercuric/Mercurous chloride	Mill 6	D009, D002	Air Pollution Control on Roaster in HW Landfill	42,000 lbs
Mercury Solids	Mill 6	D009	Clean Harbors by HW Landfill	4,000 lbs
Solvents	Mills, Leach	D001, F003	Clean Harbors by Incineration	1,100 gals
Hydrochloric, Sulfuric acid	Mills, refinery	D002	Clean Harbors by Incineration	5,000 lbs
Caustic solutions	Mills	D002	Clean Harbors by HW Landfill	2,000 lbs
Lab packs	Mills, Lab	Varies	Clean Harbors/varies	500 lbs
Lead-bearing waste	Assay Lab	D008	Clean Harbors by HW Landfill	25,000 lbs
Halogenated oil	Mills	F002	Clean Harbors by Incineration	3,000 gals.
Vanadium pentoxide catalyst	Mill 6	D009	Clean Harbors by Incineration	28,500 lbs
Barrick Operations				
Aerosol can waste, filters, paint filters	Property wide	D001,D005, D008, D018, D029,D035, D039, D040, F002, F003, F005	Clean Harbors by Incineration	1,440 lbs
Waste paint and related material	Property wide	D001,D004, D007, D008, D009,D039, F002, F003, F005	Clean Harbors by Incineration	1,120 lbs
Debris contaminated with used oil and tetrachloroethyne	Property wide	D039	Clean Harbors by Incineration	240 lbs
Inorganic lab waste	Lab	D008	Clean Harbors by Incineration	92.82 tons
Computer equipment	Property wide	D008	Clean Harbors/Metal	17.11 tons

TABLE 2-3
Hazardous Waste Stream
Carlin Trend Operations

Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
			recovery including retorting, smelting, chemical	
Baghouse dust from assay lab	Lab	D008	Clean Harbors by HW Landfill	5.07 tons
Brick, mortar , and soil	Autoclave	D008	Clean Harbors by HW Landfill	9.59 tons
HEPA filters and debris	Processing and Refining	D008	Clean Harbors by HW Landfill	7.12 tons
Used oil	Property wide	D039, D040	Clean Harbors by Incineration	17.5 tons
Used solvent	Property wide	D001	Clean Harbors by Incineration	440 lbs
Waste lead/acid batteries	Property wide	D002, D008	Clean Harbors by other treatment	400 lbs
Lead contaminated sandblast grit	Property wide	D008	Clean Harbors by HW Landfill	4.5 tons

EPA - Environmental Protection Agency; TSDF = Treatment, Storage, or Disposal Facility; gals = gallons; lbs = pounds; PPE = Personal Protection Equipment; HW = Hazaradous Waste; MIBK = Methyl Isobutyl Ketone

[1] Laboratory Clean-out Chemical Wastes

Source: BLM 2002a; Barrick 2006b; Newmont 2007e.

and recycle appear in column seven. If a chemical was not reported every year from 1998 through 2005, subscripts describing which years were reported appear on each table.

Newmont's North Area Operations released or transferred off site cumulatively over 50 million pounds of toxic release inventory chemicals from 1998 to 2005 (**Table B-3, Appendix B**). Approximately 99.7 percent of those releases were to land, the majority of which constitutes waste rock, which is placed in designed disposal facilities. Newmont's South Area Operations released or transferred over 698 million cumulative pounds of toxic release inventory chemicals from 1998 to 2005, of which over 99 percent were to land (engineered waste rock disposal facilities) (**Table B-1, Appendix B**), and the Barrick Goldstrike site released or transferred off site a cumulative amount of toxic release inventory chemicals exceeding 1.6 billion pounds during the same period. Over 99.9 percent of these releases were to land, (**Table B-2, Appendix B**). These totals can be compared with a total cumulative release of toxic release inventory chemicals for Elko County of 1.740 billion pounds from 1998 to 2005; and a total cumulative release of toxic release inventory chemicals for Eureka County for the same time period of 738 million pounds (USEPA 2007).

Under Emergency Planning and Community Right-To-Know Act Section 313 guidance, metal mining operations must report the amount of toxic release inventory chemical contained in waste rock that is placed in disposal facilities as

TABLE 2-4
Hazardous Materials Used and Stored
Carlin Trend

Substance	Newmont		Barrick		Hecla Ventures Corp.	
	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)
Diesel Fuel	19,409,502 gal.	84,000 gals	16,599,189 gals	85,000 gals	20,000 gals	30,000 gals
Gasoline	560,360 gal.	20,000 gals	376,539 gals	10,500 gals	1,000 gals	NA
Hydraulic Oil	571 gal.	3,000 gals	NA	NA	NA	NA
Motor Oil	483 gal.	1,500 gals	41,000 gals	NA	NA	NA
Antifreeze	1,537 gal.	480 gals	45,000 gals	27,000 gals	NA	NA
Explosives	-	25,000 lbs	NA	NA	30,290 lbs	NA
Prill	12,437 tons	495 tons	18,731 tons	217 tons	NA	NA
Propane	340,423 gal.	200,075 gals	17,521,843 gals	2,705,854 gals	220 gals	NA
Grease	-	2,400 lbs	NA	NA	NA	NA
Cyanide	18,224,795 gal.	75,000 gals	10,508,640 lb.s	580,010 lbs	NA	NA
Lime	112,354 tons	1,502 tons	290,657 tons	4,150 tons	NA	NA

gals = gallons; lbs = pounds; NA = Not Available
Source: Newmont 2007f.; Barrick 2007b. Hecla Ventures Corp. 2007.

a "release amount". The majority of toxic release inventory chemicals in waste rock occurs naturally-and is reported as a result of the fact that the mining company must handle and move the rock as a part of operations. Thus the release information in **Appendix B** includes small percentages by weight of toxic release inventory chemicals inherent in the large volumes of rock moved as a part of the mining operation. As a result of this reporting requirement, the data reported includes the disproportionately high percentages of "release to land" as compared with releases to surface water or air, as discussed above.

EPA also urges the reader to use judgment in interpretation of toxic release inventory information available to the public in it's guidance on the Facility Profile Report website (http://www.epa.gov/cgi-bin). EPA states, "Users of TRI information should be aware that toxic release inventory data reflect releases and other waste management activities of chemicals, not whether (or to what degree) the public has been exposed to those chemicals. Release estimates alone are not sufficient to determine exposure or to calculate potential adverse effects on human health and the environment. Toxic release inventory data, in conjunction with other information, can be used as a starting point in evaluating exposures that may result from releases and other waste management activities which involve toxic chemicals. The determination of potential risk depends upon many factors, including the toxicity of the chemical, the fate of the chemical, and the amount and duration of human or other exposure to the chemical after it is released."

Cumulative effects to the environment from chemicals reported in the toxic release inventory during the period from 1998 through 2005 can be determined in part from a review of toxic release inventory data. These data can be used as a general indicator of amounts of toxic release inventory reportable chemicals managed by various mining operations in the area to date and can also be used to determine trends associated with recycling efforts and waste minimization at the sites in question. These indicators and general trends can then be used to determine what types of impacts can be expected from similar types of operations planned in the affected area.

REASONABLY FORESEEABLE FUTURE ACTIVITIES

Solid and Hazardous Waste

Reasonably foreseeable projects in the Carlin Trend would result in similar volumes of solid and hazardous wastes stored on site, transported on state and federal highways, and disposed of at approved sites. The volumes of solid and hazardous wastes transported are expected to remain at current levels (see *Past and Present Activities* and **Appendix A**).

Production levels for mills and heap leach operations are expected to be optimized for the foreseeable mine expansions and developments. As a consequence, the volume of hazardous materials transported, stored, consumed, and disposed would remain at current levels. Portions of Gold Quarry operations that remain to be built would not result in a change in the volume or type of solid or hazardous materials currently being used in SOAPA operations.

Hazardous materials and wastes associated with Great Basin Gold's Hollister Development Block have not been determined. Mine planning is ongoing and the amount of hazardous materials that would be used in this development is contingent upon the options selected for processing ore including location, and ore processing method (mill, heap leach, custom processing).

Expansion of Barrick's Betze operations would extend the life-of-mine; production of ore and consequently use of hazardous materials would remain at current levels.

Hazardous materials that would be stored and used at the proposed Emigrant Mine are included in **Table 2-5**.

OIL, GAS, AND GEOTHERMAL LEASES

Elko District Competitive Oil and Gas Lease sales are conducted quarterly, in March, June, September, and December. Parcels proposed for lease are posted on the Nevada BLM website (www.nv.blm.gov) 45 days prior to the sale date.

Within the vicinity of the Carlin Trend, 24 tracts of land have been issued leases for oil and gas. These tracts lie within Townships 32 North to 39 North; Ranges 46 East to 54 East. Two tracts have been issued leases for geothermal. The last geophysical survey for oil and gas in the Study Area was in 2006 (BLM 2007c).

PAST and PRESENT ACTIVITIES

There are currently 24 tracts of land leased for oil and gas within the Study Area. These tracts lie within the area shown on **Figure 2-8**.

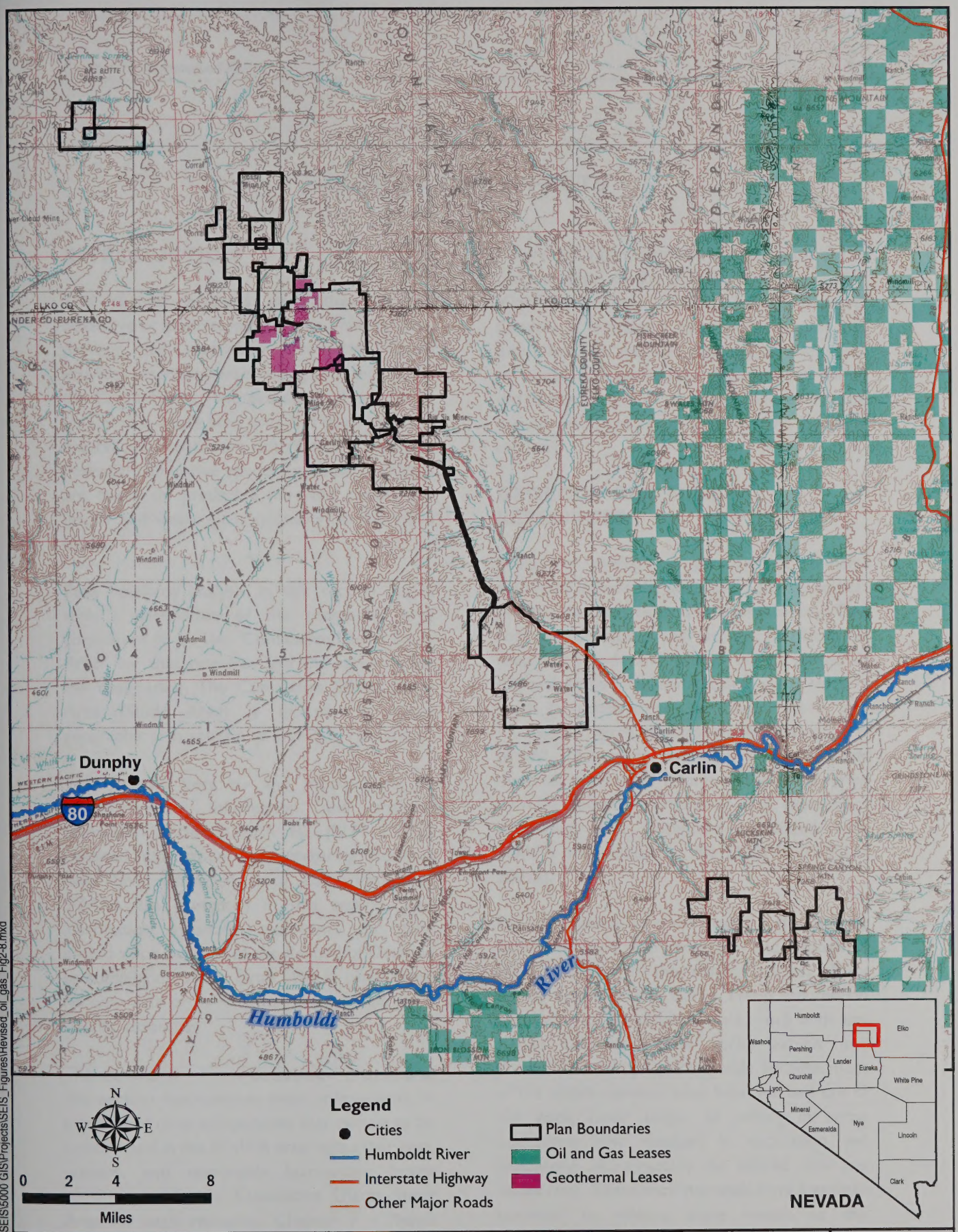
REASONABLY FORESEEABLE FUTURE ACTIVITIES

Leasing parcels is expected to continue in the future as energy demand continues to increase. No exploration or development permit applications for projects in the Study Area have been submitted to BLM. Future proposed actions may create surface disturbance, which will be analyzed when a lessee submits plans for the action (BLM 2006a).

TABLE 2-5
Hazardous Materials Management Emigrant Project

Substance	Area Used/Stored	Rate of Use (per year)	Quantity Stored On-site	Storage Method	Waste Management
Diesel Fuel	Mine/truck shop	5,300,000 gals	35,000 gals	Bulk tank	No waste
Hydraulic Fluid	Mine/truck shop	-	5,000 gals	Bulk tank totes, drums	Recycled
Motor Oil	Mine/truck shop	-	5,000 gals	Bulk tank totes, drums	Recycled
Antifreeze	Mine/truck shop	-	5,000 gals	Bulk tank totes, drums	Recycled
Explosives	Prill Silo	8,000,000 lbs	370,000 lbs	Silo	No waste
	Explosive (powder) magazine	50 tons	2,500 lbs	Magazine	No waste
Gasoline	Mine/truck shop	-	5,000 gals	Bulk tank	No waste
Propane	Mine/surface	-	5,000 gals	Bulk tank	No waste
Grease	Mine/truck shop	-	1,000 gals	Totes, drums	Recycled
Cyanide	Leach Pad	8,200,000 lbs	7,000 gals	Bulk tank	No waste
Lime	Heap Leach Facility/Lime silo	26,000 tons	250 tons	Silo	No waste

gals = gallon; lbs = pounds
Source: Newmont 2004.



U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

OIL, GAS AND GEOTHERMAL LEASE AREAS
CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
2-8

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CHAPTER 3

CUMULATIVE EFFECTS

INTRODUCTION

This chapter presents descriptions of the collective or additive impacts of combining past, present, and reasonably foreseeable future activities associated with mining and land uses in the Carlin Trend. Past, present, and reasonably foreseeable future land uses and man-made and natural occurrences are described in Chapter 2. Potential cumulative effects for some resources are based on predictive modeling results (air quality and water quantity/quality) as described below.

Each resource analysis in this section begins with a description of the geographic area considered to be the "Cumulative Effects Study Area" for that resource and the rationale for the designation. The Cumulative Effects Study Area (Study Area) is typically a unique geographic area specific to individual resources.

This analysis tiers to and incorporates by reference the information and analyses contained in the SOAPA EIS (BLM 2002a). Updated information and monitoring data that have been collected since authorization of SOAPA are presented in this section. This information generally represents the time period since issuance of the Record of Decision to compilation of this Draft SEIS. In some cases, no new data or information are available for a specific resource.

The cumulative effects description provided in this section incorporates mine components or portions of mine components that remain to be constructed in the SOAPA area with other past, present, and reasonably foreseeable future activities within the Cumulative Effects Study Area for each resource. Chapter 1 – *Project History and Status*, provides a description of the current status of the SOAPA project including mine components yet to be constructed. Chapter 2 provides a description of past and future land use activities that may have an effect on social and environmental resources within the Carlin Trend. Cumulative effects on the various resources are described in the following sections.

GEOLOGY AND MINERAL RESOURCES

Effects of mining on geology and mineral resources include the excavation and relocation of rock materials from the natural setting. Ore rock is processed in mill facilities or placed on heap leach pads and waste rock is placed in disposal facilities. In some cases, waste rock is used in construction of roads, leach pad foundations, ditch systems, stockpile areas, and backfill. Movement and disposition of rock materials in terms of volume and location varies by mine operation. Details of rock excavation, processing, and placement associated with SOAPA are included in the SOAPA EIS (BLM 2002a).

Potential release of trace metals is the primary issue associated with excavation and disposal of rock materials in the mining process. Early mining activity in the Carlin Trend focused on excavation of the oxidized rock (rock with low sulfide content). These rocks exhibit low potential to release trace metals because most of the sulfide minerals have been leached out of the rock. Later stages of mining in some operations have resulted in excavation and processing of refractory or sulfidic ore and waste rock. These rock materials have a greater potential to release trace metals to the

environment and, as a consequence, specific procedures have been implemented to manage release of trace metals from these rock types.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for geology and mineral resources is depicted on **Figure 2-7** and incorporates existing and reasonably foreseeable mining activity through 2020. The Study Area includes the Carlin Trend, which currently encompasses the proposed Emigrant Project in the southeast to the proposed Hollister Development Block in the northwest, and areas currently under lease for geothermal and oil/gas resources as shown on **Figure 2-8**.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Past and current mining and exploration operations in the Study Area have resulted in approximately 34,000 acres of surface disturbance. A total of 1,676 acres have been reclaimed in the Carlin Trend, with release of reclamation bond for 62 acres. The remaining reclaimed acreage is pending review for bond release. Approximately 4,000 acres are projected to be disturbed from 2007 through 2020 (**Table 2-2**).

Of the original proposed acreage disturbance for SOAPA (1,392 acres), approximately 390 acres have been disturbed to date including the open pit expansion, haul road construction, a portion of the soil stockpile placement, and leach pad expansions. The remaining 1,000 acres will be disturbed during the life of SOAPA, including expansion of leach areas and waste rock disposal facilities. Details of the current status of the SOAPA operation are included in *Project History and Status* in Chapter 1.

Mining operations in the Carlin Trend have developed waste rock monitoring programs. These programs require periodic sampling and analysis of waste rock generated during mining operations. This program is described in the SOAPA EIS (BLM 2002a).

CUMULATIVE EFFECTS

Large-scale mining is projected to continue in the Study Area with ongoing operations building out individual mine areas to permitted limits. Ongoing and future mine development would result in expansion to and creation of open pits; underground mines, waste rock disposal areas, heap leach pads, milling and tailing storage facilities, and the construction and operation of ore processing facilities.

Future exploration may also result in delineation of refractory ore zones that may require additional dewatering systems for economical recovery of ore. The total volume of ore, waste materials, and gold that could be economically excavated from the Carlin Trend in the future is not quantifiable as the price of gold and individual ore body characteristics dictate whether any particular ore body could be economically mined.

Topography of the area would continue to be modified as a result of mine excavation, waste rock and tailing disposal, reclamation, and other mine related surface disturbance. Construction and operation of the remaining mine components for SOAPA would add incrementally to the alteration of topography and the removal of mineral resources and mine waste within the Study Area.

Continued mining may afford the opportunity to backfill mined-out pits with waste rock from future operations. Such opportunities would be judged individually and based upon accessibility as well as influence on future mining activities. Backfilling and subsequent reclamation would

restore land to pre-mining uses, but backfilling may preclude access to additional or lower grade mineral resources.

Movement of overburden or waste rock and ore rock materials as a result of mining results in relocation of rock from natural emplacement to manmade waste rock disposal sites, heap leach piles, or tailing storage facilities. Rock that contains sulfides can react with oxygen and water (precipitation) to form acid that can liberate trace metals from the rock; providing that sulfides and trace metals are in sufficient concentration and form to be released via this mechanism.

Waste rock generated in the Study Area is sampled, tested, and classified in accordance with NDEP Waste Rock and Overburden Evaluation Guidelines (NDEP 1996) to determine potential to generate acid. Waste rock is sampled and analyzed daily for heavy metals and acid-base accounting. Potentially acid-generating (PAG) waste rock identified is segregated, encapsulated, and monitored.

Development of refractory (sulfide) ore deposits in the Study Area has increased the amount of PAG material stored in stockpiles and deposited in waste rock disposal facilities. Volume of PAG rock varies by mine site as depicted in **Table 3-1**.

Waste rock disposal facilities and sulfide ore stockpiles are designed and constructed in a consistent manner to minimize potential for acid drainage by control of the acid generation process. In general, these procedures are based on the strategy that acid generation can best be prevented by minimizing the amount of water which contacts potentially acid generating rock. Both refractory ore stockpiles and sulfide waste rock encapsulation units are designed and constructed to limit the exposure of sulfidic material to atmospheric oxygen, groundwater, direct precipitation, snowmelt, and storm water run-on. Design and construction criteria are described in the SOAPA EIS (BLM 2002a) and Newmont's Water Pollution Control Permit (Newmont 1985).

Acid rock drainage has been observed at the Hollister Project Area and the Rain Mine Waste Rock Disposal Facility. Some acid rock drainage has been observed at refractory ore stockpiles at Newmont's South Operations Area (Gold Quarry). This drainage occurs seasonally and is not measured by Newmont, but is captured and used in ore processing. Refractory ore stockpiles may be a source of acid drainage over the life of the operation, but these stockpiles will be removed after project closure and, therefore, have a relatively short-term potential for producing acid drainage. To date,

TABLE 3-1
Estimated Potentially Acid Generating (PAG) Waste Rock as a Percentage of all Waste Rock
Carlin Trend

Mine	Non-PAG Waste Rock (tons)	PAG Waste Rock (tons)	Total Waste Rock (tons)	Percent PAG of Total Waste Rock
Leeville	3,750,000	250,000	4,000,000	6.25
Emigrant	85,000,000	943,000	86,000,000	1.1
Betze/Post[1]	108,000,000	18,000,000	127,000,000	14
Pete	70,000,000	13,000,000	83,000,000	18.5
Genesis/Lantern	559,200,000	27,900,000	587,100,000	4.75
Gold Quarry	173,500,000	153,800,000	327,300,000	47

[1] 2006 data only – Barrick Goldstrike
Source: BLM 2002b; Barrick 2006c; Newmont 2007g.

with the exception of groundwater at the Hollister Project, none of the surface water or groundwater monitoring stations indicate evidence of acid-rock drainage within the Carlin Trend (see *Water Quantity and Quality* in this chapter).

Oil and Gas Production

A Reasonable Development Scenario, based on a 15-year projection, was prepared by BLM to estimate potential environmental impacts resulting from oil and gas development in the Elko Field Office area (BLM 2005a). The development scenario is based on geophysical exploration activities occurring in the area between 1954 and 1991. These dates represent the most active period of exploration in the Elko District. The last geophysical survey for oil and gas in the District was in 2000 (BLM 2005a).

Currently, 24 tracts of land have been leased for oil and gas within the Study Area as shown on **Figure 2-8**. The development scenario predicts an additional eight producing wells and 52 exploration (dry) wells will occur during the 15-year plan primarily in the Pine and Railroad Valley areas. These areas lie outside the Study Area for this resource.

Geothermal

No active explorations or development activities for geothermal resources are occurring within the lease areas depicted on **Figure 2-8**.

Sand and Gravel

Sand and gravel have not been sold nor permits issued for the use of sand and gravel on public land within the Study Area.

AIR QUALITY

Air pollutant sources within the Study Area include existing mining operations and other background sources. Emissions from mining include criteria air pollutants such as particulate matter less than 10 microns (PM_{10}), gaseous emissions (nitrogen oxides, sulfur dioxide and carbon monoxide), and trace metal Hazardous Air Pollutants such as mercury. Background emission sources include traffic on unpaved roads, windblown dust, agricultural activities, and emissions from existing and future power generation facilities.

Mining operations in the Carlin Trend are required to obtain an air quality permit from Nevada Division of Environmental Protection (NDEP) – Bureau of Air Pollution Control. These permits establish air emission levels that meet air quality standards which are protective of human health and the environment. Various air quality permits have been written for mining operations and these permits are available for public review through NDEP.

CUMULATIVE EFFECTS STUDY AREA

Cumulative impacts for air resources may result from overlap of different sources of emission located in the same general area, but not necessarily in immediate proximity to each other. The cumulative analysis discussed here includes the Leeville and SOAPA projects, Barrick operations, new TS Power Plant, and other sources of air emissions in the vicinity of the Carlin Trend.

The State of Nevada has divided the state into 250 air quality planning areas based on hydrographic basins. The Cumulative Effects Study Area (Study Area) for air resources focuses on three of these basins, encompassing approximately 986 square miles. These air basins are: Basin 51 - Maggie Creek Basin; Basin 61 - Boulder Flat Basin (both upper and lower portions of this basis); and Basin 52 - Marys

Creek Basin. The Leeville and SOAPA project elements are located entirely within two of these basins – Basin 51 and Basin 61. **Figure 3-1** illustrates locations of these air basins and facilities.

Rationale for selecting these air basins for the cumulative effects investigation is based on previous air quality modeling of Barrick's Betze/Post operations, Newmont's SOAPA and North Operations Area, and the TS Power Plant for regulated air pollutant sources conducted for the NDEP air quality permit process. Air modeling completed for the individual permits for these facilities has shown that, for each of these projects, air pollutant concentrations are localized near the project boundaries, and modeled air pollutant concentrations diminish rapidly with distance from project boundaries. None of these air pollutant emission sources are located closer than 7 kilometers (km) from the outer boundaries of these three air quality basins. Based on previous air pollutant modeling, 7 km was judged to be sufficiently large that only other past, present, and reasonably foreseeable future emission sources in these three air quality basins needed to be modeled with the Leeville and SOAPA mine emission sources to determine potential for cumulative air quality impacts.

Based on inquiry with NDEP, only three facilities with current permits issued by NDEP are located in air quality Basins 51, 52, or 61 (Upper or Lower), and no permit applications for other sources within these three basins were being reviewed by NDEP. The Leeville Project is part of the North Operations Area.

The North Operations Area (NOPA) currently operates under Class II Air Quality Operating Permit No. 1041-0402.01 issued by NDEP. Newmont's North Operations Area is a metal mining and processing operation that encompasses multiple mine areas (including the Leeville Mine) and facilities located approximately 15 miles northwest of Carlin (**Figure 2-6**). The NOPA and Leeville Mine have no emissions of NO_x, SO_2, or CO which are regulated by NDEP. NOPA is a minor source (potential to emit less than 100 tons per year) of fine particulate matter and the Leeville Mine has a fine particulate matter potential to emit less than 1 ton per year.

SOAPA is a metal mining and processing facility located approximately 6 miles northwest of Carlin, Nevada (**Figure 3-1**). The mine is located entirely within the Maggie Creek Air Quality Basin (No. 51). SOAPA operates under Class I Air Quality Operating Permit No. 1041-0793, issued by NDEP. SOAPA is a major source (potential to emit greater than 100 tons/year) of fine particulate matter, nitrogen oxides, sulfur dioxide, and carbon monoxide.

Barrick Goldstrike operates the Betze/Post Mine which is a metal mining and processing facility located approximately 27 miles north-northwest of Carlin, Nevada (**Figure 3-1**). The mine is located entirely within the Boulder Flat Air Quality Basin (No. 61 - Upper). The Betze/Post Mine currently operates under Class I Air Quality Operating Permit No. 1041-0739.01, issued by NDEP. The Betze/Post Mine is a major source (potential to emit greater than 100 tons/year) of fine particulate matter, nitrogen oxides, sulfur dioxide and carbon monoxide.

The TS Power Plant is a coal-fired power plant with four permitted (but not yet operational) simple-cycle combustion turbines fired by diesel fuel which, if constructed, would provide backup power when the coal-fired power plant is not operating. The TS Power Plant is located approximately three miles north of Dunphy, Nevada. The plant is located entirely within the Boulder Flat Air Quality Hydrographic Basin (No. 61 - Lower) (**Figure 3-1**). The TS Power Plant is currently being constructed and will operate under Class I Air Quality Operating

TABLE 3-2
Toxics Release Inventory and Nevada Mercury Control Program for Mercury in Study Area

Facility	Newmont Gold Quarry	Newmont North Area	Barrick Betze/Post	Total
TRI[1] 1998 (lbs/yr)	82	none reported	1515	1597
TRI[1] 1999 (lbs/yr)	90	none reported	1411	1501
TRI[1] 2000 (lbs/yr)	106	25	1514	1645
TRI[1] 2001 (lbs/yr)	501	34	1324	1859
TRI[1] 2002 (lbs/yr)	534	22	1299	1855
TRI[1] 2003 (lbs/yr)	565	24	1452	2041
TRI[1] 2004 (lbs/yr)	262	23	2205	2490
TRI[1] 2005 (lbs/yr)	690	19	1701	2410
NMCP[2] 2006 (lbs/yr)	311	No thermal units	617	928

[1] Toxic Release Inventory (TRI): Total of fugitive or non-point source and stack or point source mercury emissions. Numbers are calculated according to EPA guidelines (http://www.epa.gov/enviro/mercury).

[2] Nevada Mercury Control Program (NMCP), Calendar Year 2006 Actual Production/Emission Reporting Form Addendum for Mercury Emissions (NADP 2007). These data do not contain fugitive emissions.

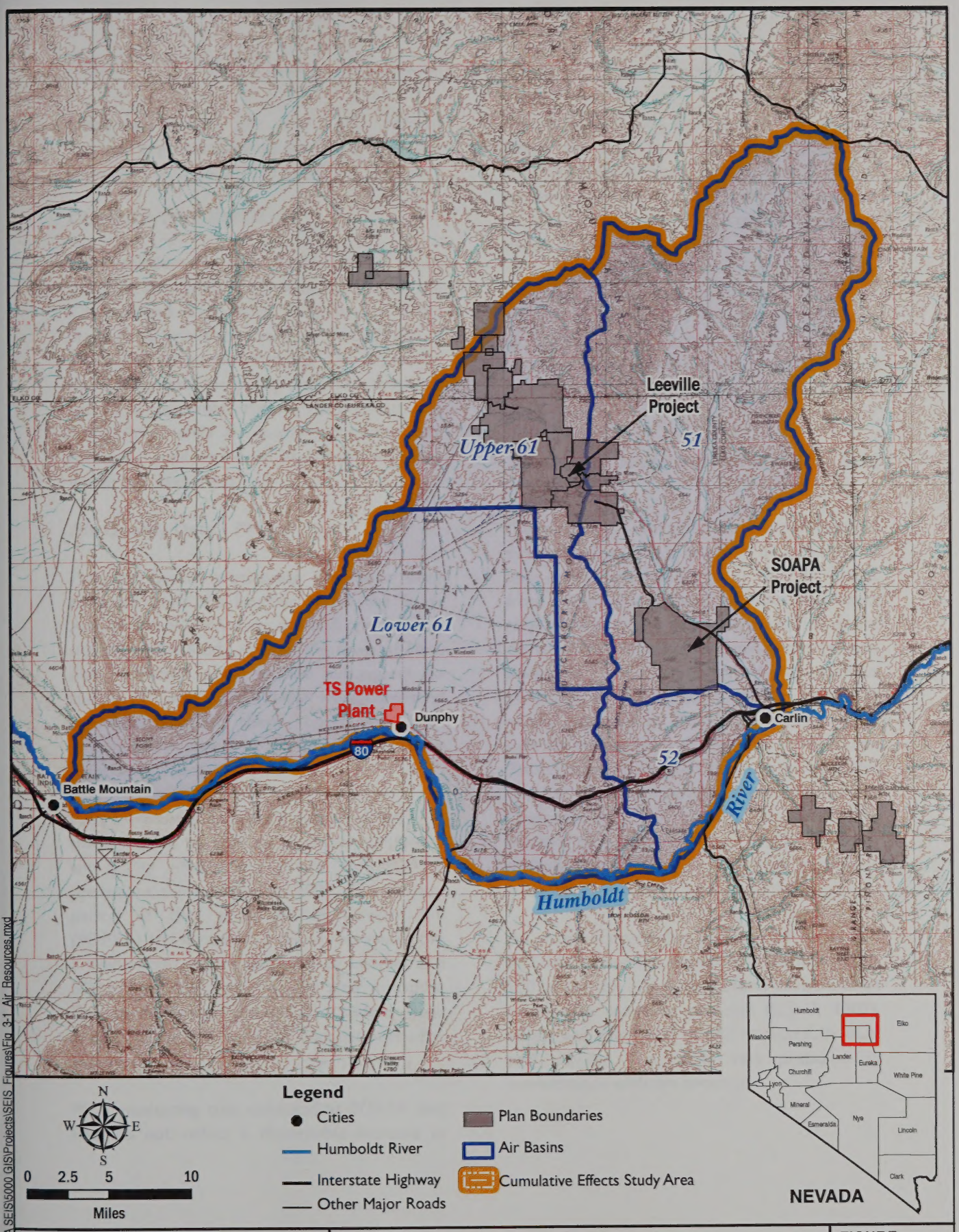
Permit No. 4911-1349, issued by the NDEP. Commercial power generation is expected by mid-2008. The TS Power Plant would be a major source (potential to emit greater than 100 tons/year) of fine particulate matter, nitrogen oxides, sulfur dioxide, and carbon monoxide.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Air quality monitoring data, which include information collected since 2002, are present in the *Cumulative Effects* section below. Data regarding mercury levels reported in annual Toxics Release Inventory programs for mining operations in the Study Area are included in **Table 3-2**. In addition, results of mercury emission levels as reported in the Nevada Mercury Control Program for companies in the Study Area for 2006 are included in **Table 3-2**.

Mercury deposition rate data have been collected from two wet-deposition monitoring sites in northern Nevada that are part of a national Mercury Deposition Network. These sites are outside the Study Area, but are the nearest source of cumulative mercury monitoring data. The monitoring data presented here represent cumulative effects from a wider area of influence than the Study Area, but are believed representative of the trend in environmental impacts from atmospheric releases of mercury involving sources in the Study Area. The Lesperance Ranch site (NV02) is located approximately 85 miles northwest of the Study Area, and the Gibbs Ranch site (NV99) is located approximately 73 miles northeast of the Study Area. These sites began collecting mercury wet deposition data in early 2003, and data are available through 2005.

Measured wet deposition for the Mercury Deposition Network sites in northeast Nevada decreased slightly from 2003 to 2005. Mercury wet deposition at the Lesperance Ranch site decreased by 11 percent from an annual total mercury wet deposition of 0.000030 grams per square meter (g/m^2) in 2003 to 0.000026 g/m^2 in 2005. At the Gibbs Ranch monitoring site, annual mercury wet deposition decreased by 7 percent from a value of 0.000043 g/m^2 in 2003 to 0.000040 g/m^2 2005. Mercury wet deposition decreased from 2003 to 2004, despite a 107 percent increase in precipitation at the



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U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

AIR RESOURCES
CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-1

Lesperance Ranch site and a 63 percent increase in precipitation at the Gibbs ranch site from 2003 to 2005 (NADP 2007).

CUMULATIVE EFFECTS

PM_{10} emissions are the prevalent type of air pollutant associated with mining activities in the Carlin Trend. Cumulative PM_{10} impacts in the Study Area have been examined through use of air quality dispersion modeling and air quality monitoring data. Air quality dispersion modeling estimates potential impacts throughout the Study Area, while air quality monitoring data measure actual emissions at specific locations within the Study Area.

Air Quality Data - PM_{10}

PM_{10} air quality monitoring data have been collected from one location within the Study Area at the SOAPA mine site and one location outside of the Study Area in the town of Elko. Data collected prior to and subsequent to startup of Leeville and SOAPA were compared to determine if these operations have incrementally added to PM_{10} concentrations from other sources.

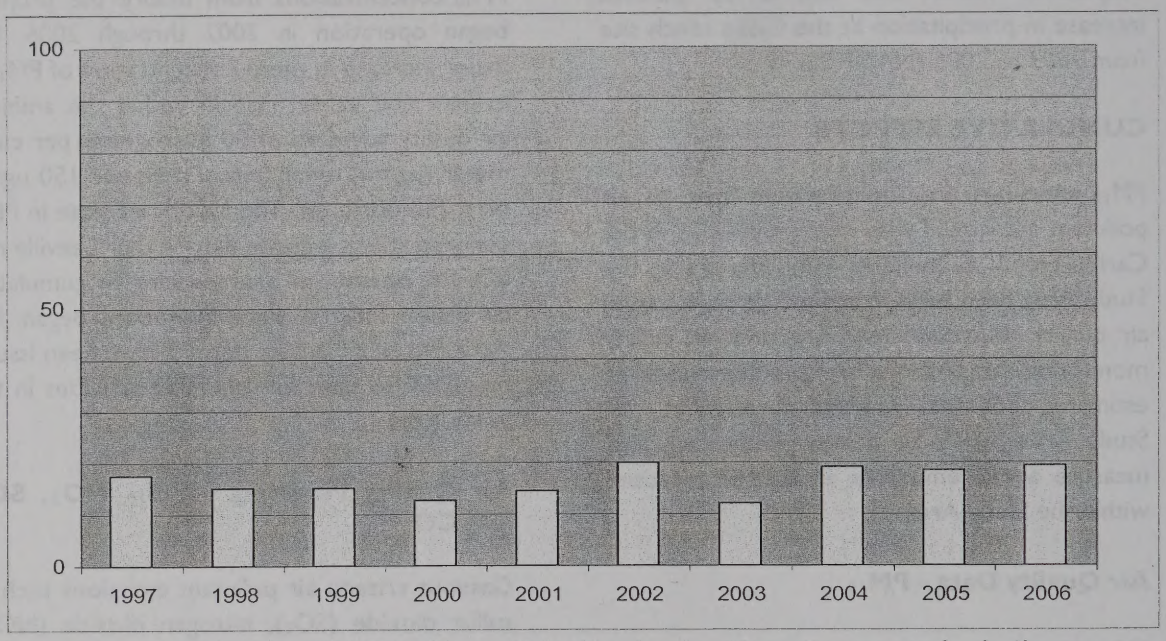
PM_{10} monitoring data were examined for 1997 through 2006 to evaluate potential cumulative air quality effects of Leeville and SOAPA operations since startup in 2002. The 10-year period of data presented in **Graph 3-1** (SOAPA) and **Graph 3-2** (Elko) represents the 5-year period before initiation of Leeville and SOAPA and the 5-year period after initiation. The term "mean" refers to calendar year average of the 24-hour PM_{10} concentrations for that year.

PM_{10} monitoring data collected at SOAPA and Elko do not reflect a discernable increase in PM_{10} concentrations from before the projects began operation in 2002 through 2006. No major increase in mean concentration of PM_{10} is evident and values remain within the ambient air quality standard of 50 micrograms per cubic meter ($\mu g/m^3$) on an annual basis and 150 $\mu g/m^3$ on a 24-hour basis. The lack of increase in PM_{10} concentrations indicate that neither Leeville nor SOAPA operations are resulting in cumulative air quality impacts since operations began. No violations of air quality permits have been issued by NDEP to date for any mine activities in the Study Area.

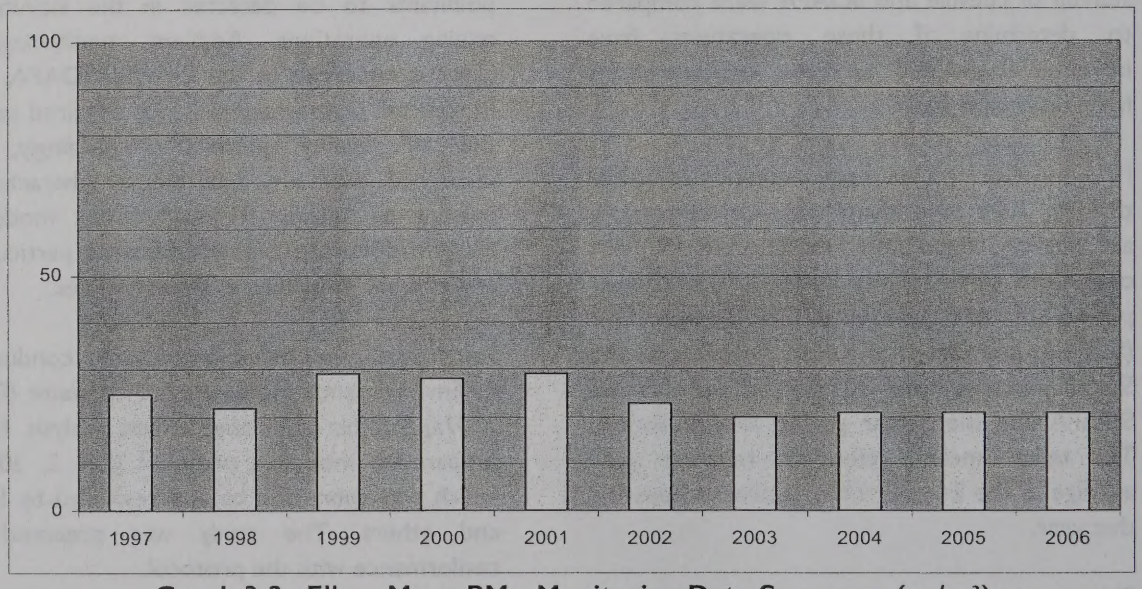
Air Quality Modeling – PM_{10}, NO_2,, SO_2, and CO

Gaseous criteria air pollutant emissions such as sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and carbon monoxide (CO) typically result from combustion related activities. For most mining projects, the major air quality issues are emissions of particulate pollutants, not gaseous pollutants. It is uncommon for gaseous pollutants to be detected in the vicinity of mining operations. Ambient monitoring of gaseous emissions at the Leeville, SOAPA, and Betze/Post mine projects is not required under the air quality permits. Accordingly, no measured data are available to characterize existing air quality. The air quality modeling analysis discussed below addresses particulate and gaseous emissions at these facilities.

An air quality modeling analysis was conducted by Environmental Management Associates (EMA 2007a) for this cumulative effects analysis. EMA prepared a modeling protocol (July 2, 2007), which was submitted to and reviewed by BLM and others. The study was prepared in conformance with the protocol.



Graph 3-1. SOAPA - Mean PM_{10} Monitoring Data Summary ($\mu g/m^3$)



Graph 3-2. Elko - Mean PM_{10} Monitoring Data Summary ($\mu g/m^3$)

TABLE 3-3
Summary of Emission Sources Included in Air Quality Modeling

Facility	Number of Model Sources	Emissions of PM_{10} (t/y)	Emissions of CO (t/y)	Emissions of NO_x (t/y)	Emissions of SO_2 (t/y)
SOAPA	84	568	337	354	276
Leeville	7	0.5	0	0	0
North Operations Area without Leeville	40	93.8	0	0	0
Betze/Post	179	579	400	311	996
TS Power Plant	28	598	744	1.170	1,546
TOTAL	**338**	**1,840**	**1,480**	**1,835**	**2,818**

t/y = tons per year; CO = carbon monoxide; NO_x = nitrogen oxides; SO_2 = sulfur dioxide.
Source: EMA 2007a.

The EPA-approved AMS/EPA Regulatory Model (AERMOD) (Version 07026) was used to conduct the air quality analysis. Trinity Consultants' BREEZE AERMOD GIS Pro v6.1.6 modeling manager was used to prepare the input files and manage AERMOD processing. The model was run using elevated terrain, PRIME building downwash algorithms, and EPA regulatory defaults. **Table 3-3** summarizes emission sources considered in the cumulative air quality modeling analysis (EMA 2007a).

A total of 338 sources of emission were included in the modeling covering all emission sources in the five facility groups noted in **Table 3-3**. Emissions were organized into a series of emission source groups so that different combinations of source impacts could be evaluated separately (EMA 2007a). A background 24-hour PM_{10} concentration of 10.2 $\mu g/m^3$, and a background annual PM_{10} concentration of 9.0 $\mu g/m^3$, were added to the maximum modeled 24-hour concentration and the maximum modeled annual concentration, respectively, to account for background PM_{10} concentrations and determine compliance with applicable Nevada Ambient Air Quality Standards.

Modeling incorporated 12 months of meteorological data (09/01/03 – 08/31/04) collected by Newmont Nevada Energy Investment, LLC from its TS Power Plant site, processed using AERMET Version 06341 using the corresponding 12 months of upper air data (09/01/03 – 08/31/04) from Elko. Processing these meteorological data was previously accepted by NDEP and, therefore, its use is justified for facility emission sources to be modeled based on proximity of the emission sources and the generally similar albedo, mid-day Bowen ratio, and surface roughness length of the locations (all are considered desert shrubland).

Modeling was conducted to determine the first high ambient air concentration for the four criteria air pollutants for the regulatory time periods presented in **Table 3-4**. Calculation of the first high concentration also ensures compliance with applicable National Ambient Air Quality Standards for the same averaging periods.

TABLE 3-4
Modeled Air Pollutants and Applicable Time Periods for Nevada First-High Standards

Criteria Pollutant	Averaging Period	Applicable Standard ($\mu g/m^3$)
Particulate Matter - 10 Microns in Aerodynamic Diameter (PM_{10})	24-Hour	150
	Annual	50
Sulfur Dioxide (SO_2)	3-Hour	1,300
	24-Hour	365
	Annual	80
Nitrogen Oxides (NO_2)	Annual	100
Carbon Monoxide (CO)	1-Hour	40,000
	8-Hour	10,000

$\mu g/m^3$ = micrograms per cubic meter
Source: EMA 2007a.

Modeling was conducted for oxides of nitrogen (NO_x), rather than nitrogen dioxide (NO_2), the pollutant for which ambient standards have actually been adopted. In general, emissions of NO_X, which consists of both NO_2 and other oxides of nitrogen, are substantially more accurate to estimate, and each of the projects modeled in this assessment estimated NO_x emissions for the NDEP regulatory process. Since an assessment using NO_x is consistent with the EPA's Guideline on Air Quality Models (Appendix W to 40 CFR PART 51), and results in a conservative assessment which would over-predict the anticipated ambient concentrations of NO_2 resulting from the sources modeled, NO_X emissions are usually calculated.

No assessment of fine particle ($PM_{2.5}$) concentrations has been undertaken. No estimate of fine particle emissions has been previously prepared during any regulatory process for any of the three metallic mines subject to this cumulative assessment, in large part because the current EPA emission estimating guidance for metallic minerals processing (AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Volume I, Chapter 11: Mineral Products Industry, Section 11.24 Metallic Minerals Processing (08/82)) contains no estimating factors for fine particle emissions. Metallic mineral processing produces few $PM_{2.5}$ emissions, as primary fine particle emissions typically are produced from sources such as diesel engines, wood burning activities, and other industrial and commercial combustion processes. NDEP has to date determined that meeting the PM_{10} standards and control measures serves as a surrogate approach for controlling $PM_{2.5}$ emissions and protecting air quality.

Receptors are the locations at which the model was directed to calculate concentrations. Modeling was conducted using Cartesian grid receptors, spaced at 1,000-meter intervals from the boundary of each facility which prevents or deters access by the public to the outer boundary of the three air quality basins (No. 51, No. 52 or No. 61 (Upper and Lower)). In addition, receptors were selected to address impacts in Class I areas. The closest Class I airshed to the Study Area is the Jarbidge Wilderness, the southwest corner of which is located approximately 109 and 104 km northeast of the closest SOAPA and Leeville Mine emission sources, respectively. To evaluate potential cumulative air quality impacts to this Class I airshed, model receptors were located 50 km from the Leeville Mine and SOAPA sources closest to the southwest corner of the Jarbidge Wilderness Class I airshed on a line from each source to this

corner of the Class I airshed. Although located less than half the distance to the Class I airshed, placement of these receptors at 50 km from these sources is consistent with EPA's Guideline on Air Quality Models (Appendix W to 40 CFR PART 51). EPA's position is that 50 km is the nominal distance appropriate for Gaussian models such as AERMOD. Modeling results confirm no impact to the Class I airshed.

Table 3-5 shows the maximum first high ambient air pollutant concentrations of PM_{10}, SO_2, NO_x, and CO modeled from all modeled sources are below the applicable ambient air quality standard, even with the addition of the applicable background concentration. **Table 3-5** also shows that the maximum first high ambient air pollutant concentrations modeled at the Cartesian grid receptors from the SOAPA emission sources alone are nearly equal to the maximum cumulative modeled concentrations.

Although neither the Leeville nor SOAPA mines are subject to the federal Prevention of Significant Deterioration regulations (40 CFR 52.21), ambient air pollutant concentrations modeled at the two receptors used to estimate potential impacts to the Class I airshed can be compared to Class I increments under the Prevention of Significant Deterioration regulations. As shown in **Table 3-6**, the maximum first high ambient air pollutant concentrations modeled from all modeled sources at the two receptors are below ten percent of the Class I Prevention of Significant Deterioration increments (EMA 2007a).

In addition to EMA's air quality dispersion modeling analyses of the Study Area, other air quality dispersion modeling studies of the region confirm that air quality impacts from these facilities tend to be confined to the facility area, with little potential for overlap or cumulative impact as discussed below. Reported concentrations in the following site-specific modeling analyses are conducted with the receptor placed at the fence line as per NDEP requirements for permitting. In the preceding discussion, receptors were placed outside of the project boundaries to simulate cumulative effects.

South Operations Area Modeling

The South Operations Area dispersion modeling analysis predicted maximum cumulative annual PM_{10} impacts of 15.03 $\mu g/m^3$ and maximum 24-hour PM_{10} impacts of 76.67 $\mu g/m^3$. Predicted PM_{10} impacts represent 30 percent of the annual Nevada PM_{10} ambient air quality standard of 50 $\mu g/m^3$ and 51 percent of the 24-hour PM_{10} ambient air quality standard of 150 $\mu g/m^3$. Applying the ambient air quality standards as criteria, predicted air quality impacts from the South Operations Area dispersion modeling demonstrates that cumulative PM_{10} air impact issues would be below all applicable criteria in the air quality Study Area (air basins). Based on these results, NDEP concluded that SOAPA would comply with the PM_{10} ambient air quality standard and could be permitted and operated as proposed.

The air quality dispersion modeling study for the South Operations Area included predicted impacts of gaseous criteria air pollutants SO_2, NO_2, and CO. This modeling was completed in 2006 (EMA 2006). The SOAPA dispersion modeling analysis predicted the following maximum cumulative effects:

- 3-hour SO_2: 122.09 $\mu g/m^3$ (ambient air quality standard = 1,300 $\mu g/m^3$)
- 24-hour SO_2: 29.58 $\mu g/m^3$ (ambient air quality standard = 365 $\mu g/m^3$)
- Annual SO_2: 2.95 $\mu g/m^3$ (ambient air quality standard = 80 $\mu g/m^3$)
- Annual NO_2: 3.50 $\mu g/m^3$ (ambient air quality standard = 100 $\mu g/m^3$)

1-hour CO: 101.08 µg/m³ (ambient air quality standard = 40,000 µg/m³)
8-hour CO: 25.21 µg/m³ (ambient air quality standard = 10,000 µg/m³)

Predicted air quality impacts range from 0.3 percent of the CO ambient air quality standard to 9 percent of the 3-hour SO_2 ambient air quality standard. Background concentrations were not added to these impacts in the analysis, in part because the impacts were low and the lack of gaseous air pollutant monitoring data. By applying the ambient air quality standard as significance criteria, it is reasonable to assume that the predicted SO_2, NO_2, and CO air quality impacts from the South Operations Area dispersion modeling demonstrate no significant effects issues in the Study Area (**Figure 3-1**). Based on this analysis, NDEP concluded that SOAPA would comply with the SO_2, NO_2, and CO ambient air quality standard and could be permitted and operated as proposed.

North Operations Area Modeling

The North Operations Area dispersion modeling analysis predicted maximum cumulative annual PM_{10} effects of 12.20 µg/m³ and maximum 24-hour PM10 impact of 63.1 µg/m³. Predicted PM_{10} impacts represent 42 percent of the annual Nevada PM_{10} ambient air quality standard of 50 µg/m³ and 24 percent of the 24-hour PM_{10} ambient air quality standard of 150 µg/m³ (EMA 2007b). Predicted air quality impacts from North Operations Area indicate that cumulative PM_{10} air impacts would be below applicable criteria in the Study Area. Based on these results, NDEP concluded that North Operations Area (including the Leeville Mine) could be permitted.

Barrick Goldstrike Modeling

Modeling analysis of emission sources at Barrick's Betze operations predicted maximum cumulative annual PM_{10} effects of 10.62 µg/m³ and maximum 24-hour PM_{10} impact of 16.65 µg/m³. Predicted PM_{10} impacts represent 21 percent of the annual Nevada PM_{10} ambient air quality standard of 50 µg/m³ and 11 percent of the 24-hour PM_{10} ambient air quality standard of 150 µg/m³. Predicted air quality impacts from Barrick Betze indicate that cumulative PM_{10} air impacts would be below applicable criteria in the Study Area.

The air quality dispersion modeling study for Barrick operations included predicted impacts of gaseous criteria air pollutants SO_2, NO_2, and CO. This modeling was completed in 2006 (EMA 2006). The dispersion modeling analysis predicted the following maximum cumulative effects:

3-hour SO_2: 13.03 µg/m³ (ambient air quality standard = 1,300 µg/m³)
24-hour SO_2: 2.94 µg/m³ (ambient air quality standard = 365 µg/m³)
Annual SO_2: 0.4 µg/m³ (ambient air quality standard = 80 µg/m³)
Annual NO_2: 0.83 µg/m³ (ambient air quality standard = 100 µg/m³)
1-hour CO: 216.49 µg/m³ (ambient air quality standard = 40,000 µg/m³)
8-hour CO: 38.25 µg/m³ (ambient air quality standard = 10,000 µg/m³)

Background concentrations were not added to these impacts in the analysis, in part because the impacts were low and the lack of gaseous air pollutant monitoring data. By applying the ambient air quality standard as significance criteria, it is reasonable to assume that the predicted SO_2, NO_2, and CO air quality impacts from Barrick's Betze operations dispersion modeling demonstrate no significant effects issues in the Study Area (**Figure 3-1**).

TABLE 3-5
Results of Modeling for the Cartesian Grid Receptors

Criteria Pollutant	Averaging Period	First High Concentration ($\mu g/m^3$)				Total % of Ambient Standard	First High Concentration ($\mu g/m^3$)		
		Ambient Standard	Maximum Cumulative High	Background	Total		Maximum Cumulative High	Maximum SOAPA High	Maximum Incremental Increase
Particulate Matter <10 Microns in Aerodynamic Diameter (PM_{10})	24-hour	150	47.99	10.20	58.19	38.797 %	47.99	47.74	0.2
	Annual	50	4.97	9.00	13.97	27.94%	4.97	4.73	0.24
Sulfur Dioxide (SO_2)	3-hour	1,300	37.45	0.00	37.45	2.88%	37.45	37.35	0.10
	24-hour	365	8.45	0.00	8.45	2.31%	8.45	8.07	0.38
	Annual	80	1.02	0.00	1.02	1.28%	1.02	0.90	0.12
Nitrogen Oxides (NO_X)	Annual	100	1.09	0.00	1.09	1.09%	1.09	0.94	0.16
Carbon Monoxide (CO)	1-hour	40,000	218.21	0.00	218.21	0.55%	218.21	96.57	121.64
	8-hour	10,000	38.43	0.00	38.43	0.38%	38.43	17.14	21.30

$\mu g/m^3$ = micrograms per cubic meter;

TABLE 3-6
Results of Class I Airshed Increment Modeling

Criteria Pollutant	Averaging Period	First High Concentration ($\mu g/m^3$)		Percent of Class I Increment	First High Concentration ($\mu g/m^3$)		
		Class I PSD	Maximum Cumulative High		Maximum Cumulative High	Maximum SOAPA High	Maximum Incremental Increase
Particulate Matter <10 Microns in Aerodynamic Diameter (PM_{10})	24-hour	8	0.5096	6.37%	0.5096	0.3056	0.2040
	Annual	4	0.0863	2.16%	0.0863	0.0307	0.0556
Sulfur Dioxide (SO_2)	3-hour	25	1.4386	5.75%	1.4386	0.6678	0.7708
	24-hour	5	0.4159	8.32%	0.4159	0.2160	0.1999
	Annual						
Nitrogen Oxides (NO_X)	Annual	3	0.0593	2.37%	0.0593	0.0216	0.0377

$\mu g/m^3$ = micrograms per cubic meter; PSD = Prevention of Significant Deterioration
Source: EMA 2007a.

TS Power Plant Modeling

The TS Power Plant is a new 200-MW coal-fired electrical generating facility currently under construction and is scheduled to be operational by 2008. The State of Nevada has issued a Class I permit for the TS Power Plant. The TS Power Plant is located in Lower Basin 61, approximately 18 miles west of the Leeville and SOAPA facilities. Air quality dispersion modeling analysis approved by the State of Nevada is in the permit application technical analysis (ENSR 2004). The TS Power Plant air quality dispersion modeling analysis examined the potential impact of PM_{10} as well as SO_2, NO_2, and CO in Lower Basin 61, where the facility is located, as well as the impacts from the facility in nearby Upper Basin 61(where the Leeville Project is located), Basin 51(where South Operations Area is located), and Basin 62.

Predicted potential PM_{10} air quality impacts from the TS Power Plant indicate no exceedances above air permitting Significant Impact Levels in any of the four air basins, eliminating the need for further cumulative analysis in the NDEP air permitting process. Prediction of maximum impacts below the Significant Impact Levels supports the conclusion that there would be no cumulative effect of consequence between the TS Power Plant and other sources in the Carlin Trend. The maximum predicted 24-hour PM_{10} impact from the TS Power Plant facility is 3.86 $\mu g/m^3$ and the maximum predicted annual PM_{10} impact is 0.48 $\mu g/m^3$. The expected contribution from the TS Power Plant in the Carlin Trend would be lower than these values given the additional dispersion that would occur over the distance to other sources. Predicted air quality impacts from the TS Power Plant dispersion modeling demonstrates cumulative PM_{10} air effects would be below ambient standards in the air quality Study Area (**Figure 3-1**).

Potential SO_2, NO_2, and CO emissions from the power plant were examined from an air quality dispersion modeling analysis submitted with the permit application and subsequently approved by NDEP (ENSR 2004). The TS Power Plant air quality dispersion modeling analysis examined potential SO_2, NO_2, and CO impacts in Lower Basin 61, as well as the TS Power Plant impacts in nearby Upper Basin 61(where Leeville Project is located), Basin 51(where South Operations Area is located), and Basin 62.

Predicted potential SO_2, NO_2, and CO emissions from the TS Power Plant were below the air permitting Significant Impact Levels in each of the four air basins. Maximum predicted effects from the TS Power Plant for SO_2, NO_2, and CO are presented below:

3-hour SO_2:	24.69 $\mu g/m^3$ (SIL = 25 $\mu g/m^3$)
24-hour SO_2:	4.88 $\mu g/m^3$ (SIL = 5 $\mu g/m^3$)
Annual SO_2:	0.46 $\mu g/m^3$ (SIL = 1 $\mu g/m^3$)
Annual NO_2:	0.56 $\mu g/m^3$ (SIL = 1 $\mu g/m^3$)
1-hour CO:	181.07 $\mu g/m^3$ (SIL = 2,000 $\mu g/m^3$)
8-hour CO:	25.10 $\mu g/m^3$ (SIL = 500 $\mu g/m^3$)

Criteria Air Pollutant Impact Conclusions

The PM_{10}, SO_2, NO_2, and CO modeling predictions and monitoring data presented in this section underscore the lack of cumulative air quality impacts in the Study Area. While changes in permitted criteria air pollutant emissions are expected in the Study Area and outside the region, known projects are not located in close proximity to Leeville, SOAPA, and other sources in the Study Area. Consequently cumulative impacts involving reasonably foreseeable projects would not result in exceedances of ambient air quality standards. Safeguards included in the NDEP permitting process would restrict air emissions such that cumulative effects to air quality from multiple sources would not violate ambient air quality standards.

Hazardous Air Pollutants

Mercury, a trace metal Hazardous Air Pollutant identified in the Clean Air Act, is often bound in gold ore and can be released into the atmosphere through a variety of thermal treatment processes involved with the refining of gold including autoclaves, carbon kilns, furnaces, retorts, and roasters. In addition to manmade facilities such as mines, power plants, and vehicle exhaust that release mercury, Nevada has large areas of naturally occurring mercury. Natural sources include gases from volcanic areas and geothermal vents, as well as evaporation from naturally enriched soil and wetlands. Background concentrations of mercury also exist in the atmosphere from distant sources. Background levels vary from location to location and from one time period to another but generally fall in the range of 0.001 to 0.004 micrograms per cubic meter ($\mu g/m^3$) (Slemr and Langer 1992; Lin and Pehkonen 1999) in remote locations far from human sources.

In 1998, EPA began requiring mining companies to report annually under the Toxics Release Inventory program (Section 313 - Emergency Planning and Community Right-to-Know Act). Variations in reported values of mercury (**Table 3-2**) are due in part to changes in calculation methods but also reflect changes in ore throughput and mercury concentrations within the ore. Addition of mercury controls and/or maintenance of controls in mill facilities also affect reported values. The State of Nevada adopted regulations in 2006 (Nevada Mercury Air Emissions Control Program) to require a mercury operation permit to construct and regulate mercury emissions for thermal units located at stationary sources that process gold or silver ore (Nevada Administrative Code (NAC) 445B.2 through NAC 445B.41). The 2006 mercury emissions for the Carlin Trend presented in **Table 3-2** represent 2006 data, the first year of reporting required under the new program.

A recent modeling effort conducted by ICF International for EPA compiled mercury emissions for the contiguous 48 States, Southern Canada, and Northern Mexico, and evaluated deposition rates of airborne mercury from both domestic and international sources (ICF 2006). The ICF study concluded, consistent with modeling results for other pollutants, the dominant influence on air quality impacts for mercury is generally the source closest to the receptor. Overlapping or cumulative effects were not substantial at peak impact locations and mercury impacts across state boundaries are low. For example, model-predicted deposition rates at the peak location in Utah showed that mercury contribution at that point was caused predominantly by sources in Utah (74.7 percent) and secondarily by source from outside the US (21.9 percent). Neighboring states, including Nevada, accounted for approximately 0.2 percent of mercury deposition at the peak location in Utah.

Of the states bordering Nevada (i.e., California, Arizona, Utah, and Idaho), all had peak mercury deposition rates higher than Nevada; Oregon had slightly lower deposition rates. With the exception of Arizona, the contribution of mercury from neighboring states was less than 1 percent of the total at the peak deposition location (ICF 2006). Annual mercury emissions from Nevada and the surrounding five states are summarized in **Table 3-7.**

Total mercury emissions from the Carlin Trend totaled 928 lbs/yr (**Table 3-2**) as measured from stacks or point sources. This represents 29 percent of total Nevada mercury annual emissions or approximately 3.4 percent of the emissions from Nevada and the five surrounding states.

TABLE 3-7 Annual Mercury Emissions by State	
State	**Total Mercury (tons/year)**
Arizona	1.043
California	7.489
Oregon	1.737
Nevada	1.617
Idaho	0.835
Utah	0.974
Total	**13.70**

Source: ICF 2006

Scientists are beginning to collect and analyze mercury air emission, dispersion, and deposition data. Annual emission measurements required by NDEP under the Nevada Mercury Control Program will contribute to understanding mercury in the environment. In addition to emissions measurements, the Nevada Mercury Control Program relies on using and maintaining mercury controls which are subject to a Maximum Achievable Control Technology determination, as well as testing, sampling, operation, maintenance, monitoring, recordkeeping, and reporting to meet permit requirements.

WATER QUANTITY AND QUALITY

Water resources in the Study Area include surface water (streams, rivers, springs, and seeps) and groundwater. Principal drainages include Maggie Creek, Susie Creek, Marys Creek, Boulder Creek, Rock Creek, and Willow Creek – all tributary to the Humboldt River. These sources of surface water support livestock, wildlife, fish, aquatic animals, birds, and vegetation, and are hydrologically connected to groundwater systems.

Use of groundwater from aquifers in the Study Area includes mining, dewatering, municipal, stock water, irrigation, and other uses. Mining operations are the primary user of groundwater resources within the Cumulative Effects Study Area, including milling ore, heap leaching, dust control, and potable supply.

Some mining operations in the Carlin Trend extend below the groundwater table and, therefore, require dewatering wells to maintain water levels below the mine workings. Groundwater in excess of the needs of mine-related operations is discharged to streams, rivers, infiltration/evaporation ponds, injection wells, and irrigation systems. Groundwater management associated with dewatering and discharge activities is conducted under permits administered by the Nevada State Engineer and NDEP.

The Ninth Circuit Court of Appeals concluded that the SOAPA (BLM 2002a) and Leeville (BLM 2002b) EISs and Cumulative Impact Analysis (CIA) of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project (BLM 2000) report provided detailed analyses of cumulative effects associated with mine groundwater pumping. The analysis of water-related cumulative impacts in this Draft SEIS tiers to and incorporates by reference those analyses.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for water quantity and quality encompasses surface water and groundwater in the vicinity of the Carlin Trend (**Figure 3-2**), including hydrographic basins that contain mine development areas and receive dewatering water, and areas where groundwater drawdown has occurred and is predicted to expand due to mine dewatering. The basins included in the Study Area are: Susie Creek (No. 50), Maggie Creek (No. 51), Marys Creek (No. 52), Boulder Flat (No. 61), Rock Creek (No. 62), and Willow Creek (No. 63). All of these basins are tributary to the Humboldt River, beginning near the town of Carlin, and extending down-river to the town of Battle Mountain (**Figure 3-2**).

The Study Area for this analysis is the same as the area evaluated in BLM's April 2000 cumulative impact analysis (CIA) report – "Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project" (BLM 2000). For that assessment, mine discharges were evaluated from the SOAPA, Betze/Post, Leeville, and Lone Tree mines. The Lone Tree Mine ceased dewatering activities in December 2006 and is therefore not included in this cumulative effects analysis.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Water resources within the cumulative analysis area are monitored by several entities for a variety of purposes. Although most sites are established to monitor impacts from mining, impacts from livestock grazing, wildfires, industrial developments, and agricultural activities are also reflected in the data. Descriptions of the water monitoring sites and activities north of and including the Humboldt River are included in the SOAPA EIS (BLM 2002a), Leeville Project EIS (BLM 2002b), Betze Project Supplemental EIS (BLM 2003), and CIA report (BLM 2000).

The following primary water monitoring plans or programs incorporate monitoring activities for surface water and groundwater in the Carlin Trend area:

- Maggie Creek Basin Monitoring Plan (MCBMP): Since 1989, Newmont has been conducting monthly monitoring reported semi-annually of surface water and groundwater in the Maggie Creek Basin related to mining and dewatering at Gold Quarry and Leeville mines. The Monitoring Plan includes measurement of surface water flow, depth to groundwater, and quality characteristics for surface water stations, wells, piezometers, and springs in the Maggie Creek, Marys Creek, Susie Creek, and the southeast portion of Boulder Flat hydrographic basins.

- Leeville Hydrologic Monitoring Plan (LHMP): Since 2003, Newmont has been reporting the results of ongoing monitoring of water resources in the vicinity of the Leeville Mine site under the auspices of the LHMP. Results of this monitoring program are included in the MCBMP monitoring reports.

- Boulder Valley Monitoring Plan (BVMP): Since 1990, Barrick has conducted monthly monitoring reported semi-annually of surface water and groundwater in Boulder Valley related to mining activities primarily at the Betze Mine. Surface water monitoring stations are located on Bell Creek, Brush Creek, Antelope Creek, Boulder Creek, Rodeo Creek, and Rock Creek. Groundwater monitoring wells and springs are also included in the Plan. These sites are monitored for surface water flow, depth to groundwater, and/or quality characteristics.

- Spring Survey by Barrick: Annual spring and seep monitoring is performed, characterizing chemistry, flow rates, and vegetation at up to 36 sites located in the Tuscarora Mountains.

- Spring Survey by Newmont: Since 1990, Newmont has been monitoring springs and seeps in the same four hydrographic basins mentioned above as part of Gold Quarry Mine monitoring. A total of 33 springs are monitored annually in the fall. Fourteen of these are required by BLM in either the SOAP or Leeville mitigation plans. Monitoring consists of measuring flow and characterizing water quality and general site conditions.

- The BLM Elko Field Office has conducted lentic (springs, seeps, and pond) and lotic (streams) assessments at selected grazing allotments in the Carlin Trend and surrounding areas. These assessments primarily address effects of livestock grazing on springs, seeps, ponds, and streams.

All water resources monitoring data are made available in semi-annual monitoring reports submitted by Barrick and Newmont to the BLM, NDEP, and Nevada Division of Water Resources (NDWR). Some surface water stations are maintained by the U.S. Geological Survey (USGS 2007; Newmont 2007d).

Groundwater Quantity

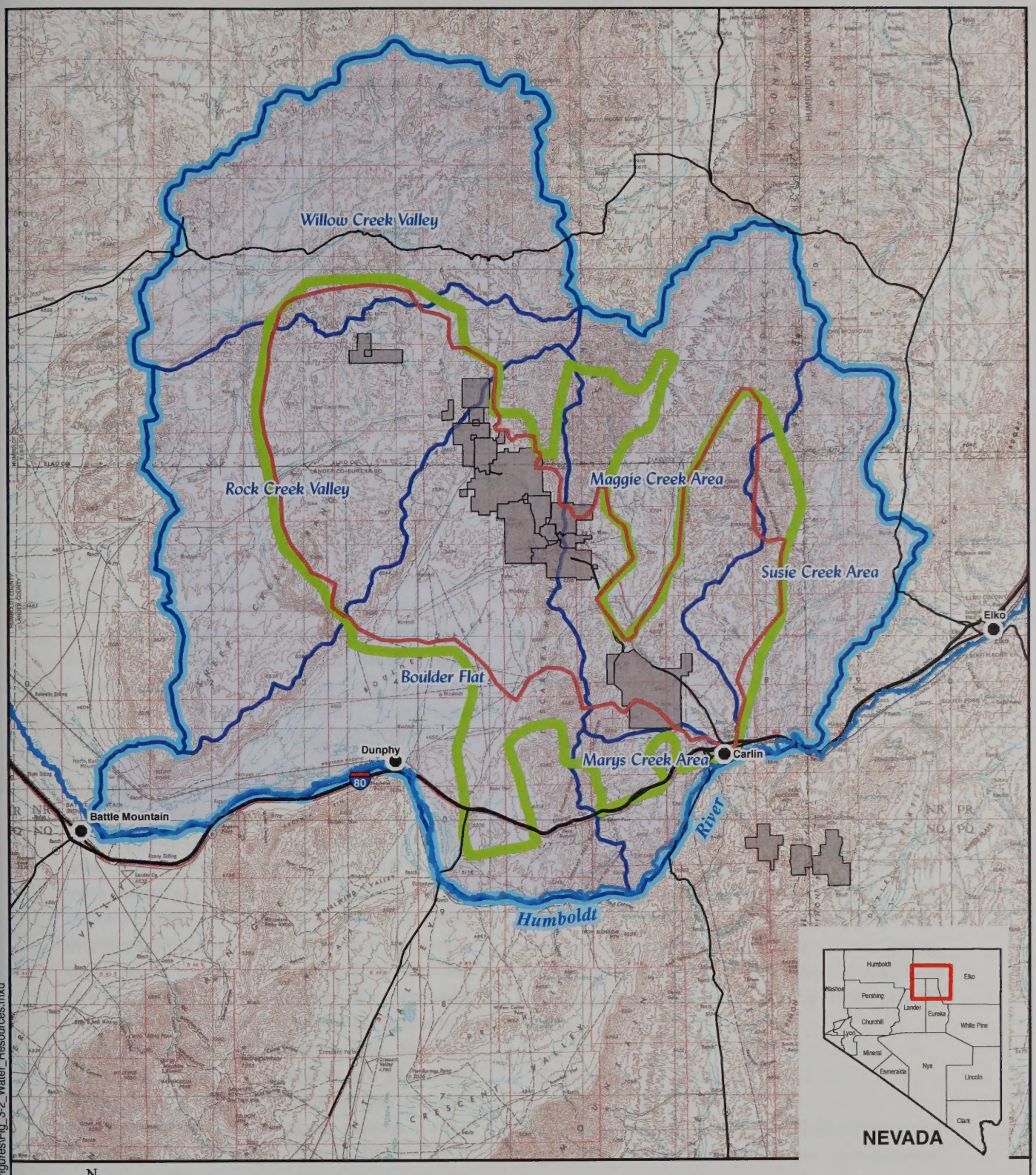
As documented in the CIA report (BLM 2000b), results of groundwater level monitoring show that drawdown has been occurring in a large portion of the Study Area, beginning between 1988 and 1990 for the Betze and Gold Quarry mines. Dewatering at the Leeville Mine began in 2003. By 2000, up to 1,500 feet of groundwater drawdown had occurred in the Betze Mine area, and up to 800 feet drawdown was present in the Gold Quarry Mine area (BLM 2000; Newmont 2007d). By the end of mine-life, maximum groundwater drawdown due to dewatering is approximately 1,700 feet in the vicinity of the Betze Mine; 1,400 feet in the vicinity of Gold Quarry Mine (BLM 2002a); and 1,900 feet in the vicinity of Leeville Mine (BLM 2002b).

In 2006, average groundwater pumping rates for the Gold Quarry and Leeville mines was 14,000 gpm and 14,500 gpm, respectively (Paine 2007). In comparison, the average pumping rate was 11,200 gpm from Gold Quarry in 2000, and 5,300 gpm from Leeville in 2003 (Paine 2007). For the Betze Mine, the average groundwater pumping rate during 4th quarter 2006 and 1st quarter 2007 was 18,000 gpm (Barrick 2007a).

Not all groundwater pumped for mine dewatering is lost to the water balance of the affected hydrologic basins because a percentage of the pumped water is reinfiltrated. Over 50 percent of pumped groundwater typically is infiltrated for the Betze and Leeville mines, with less than 10 percent of pumped groundwater being subject to infiltration from the Gold Quarry Mine.

Two general areas of water infiltration and groundwater mounding in the Study Area are (1) TS Reservoir area and irrigated fields in the Boulder Valley; and (2) Maggie Creek Reservoir and irrigated Hadley fields in the Maggie Creek Valley. The Leeville and Betze mines contribute to infiltration in Boulder Valley, and Gold Quarry dewatering provides infiltration water in Maggie Creek Valley. Up to 55 feet of groundwater mounding has been documented in the vicinity of the two reservoir sites (HCI 2007a).

The TS Power Plant is currently under construction 3 miles north of Dunphy in the Boulder Valley. Groundwater pumping wells to supply makeup water needs for the plant are located approximately 12 miles north of the



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Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries
- Hydrographic Sub-basins
- Cumulative Effects Study Area

Area of Predicted Groundwater Drawdown Due to Dewatering of All Carlin Trend

- Updated 2007 Carlin Trend Model
- CIA Model (BLM 2000)

U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

WATER QUANTITY AND QUALITY
CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-2

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Humboldt River in Boulder Valley. Average groundwater pumping for the power plant would be approximately 5.3 cfs or 2,400 gpm for its expected 50-year life (HCI 2007b).

At the time the CIA report (BLM 2000) was prepared, numerical models were used to predict maximum extent of groundwater drawdown due to dewatering at the Gold Quarry, Betze, and Leeville mines. Since that time, HCI has updated the Newmont model several times, with the most recent update performed in 2007 (HCI 2007a). Dewatering associated with the Hollister Development Block Exploration Project (underground exploration decline) has not been included in the numerical models. Dewatering at Hollister averaged 350 gpm in 2006 and, therefore, would not be expected to have a measurable effect on groundwater drawdown in the Study Area. The Hollister Development Block project is located within the area of predicted drawdown resulting from cumulative dewatering on the Carlin Trend (HCI 2007a).

Surface Water Quantity

Surface water flow in the Humboldt River and area streams can potentially increase due to mine discharges of excess dewatering water, or decrease due to dewatering activities that intercept groundwater that normally recharges these water bodies. Since 2000, flow rates for streams and the Humboldt River have remained within natural fluctuation ranges. Surface water flow hydrographs for Antelope, Bell, Boulder, Brush, Rock, and Rodeo creeks are presented in the Boulder Valley Monitoring Plan (Barrick 2007a). Hydrographs for gaging stations on the Humboldt River, Maggie Creek, Susie Creek, and Marys Creek are provided in the Maggie Creek Basin Monitoring Plan (Newmont 2007d). No discharges of mine dewatering water to the Humboldt River via the Boulder Valley conveyance system have occurred since February 3, 1999.

Based on the CIA report (BLM 2000), a total of approximately 500 springs were identified within the predicted cumulative groundwater drawdown area in the Study Area. Currently, 33 of these springs/seeps are monitored by Newmont (2007d, 2007h) in the vicinity of the Gold Quarry and Leeville mines, and 23 springs/seeps are monitored by Barrick (AATA 2006) in the vicinity of the Betze/Post Mine. Most of these springs have been monitored annually or biannually starting in the early 1990s. Initial surveys included a spring and fall sampling event; however, most spring/seep monitoring is now conducted only in the fall. All surface water monitoring results are provided to the BLM, NDEP, and NDWR in semi-annual or annual reports.

Surface water rights, including springs, within the Study Area are described in the SOAPA EIS (BLM 2002a), Leeville Project EIS (BLM 2002b), and CIA report (BLM 2000). Primary uses for surface water are stock watering, municipal, irrigation, and domestic. According to the CIA report (BLM 2000), a total of 121 surface water rights were recorded for the Study Area. Of these water rights, four notifications of public water reserve were filed for springs under the 1926 Executive Order, Order of Withdrawal, Public Water Reserve No. 107 (PWR 107). The Humboldt River adjudication appropriated water tributary to the Humboldt River. Springs tributary to the Humboldt River would have been appropriated prior to the 1926 priority date.

Groundwater Quality

Assessment of the effects of Gold Quarry and Leeville mine operations on groundwater quality are provided by monitoring data generated by sampling and analyzing water samples from several monitoring and dewatering wells at the Newmont mines. These results are presented by Newmont (2007d) in its Maggie Creek Basin Monitoring Plan.

Similarly, several monitoring wells in the vicinity of the Betze Mine Complex are sampled and analyzed by Barrick (2007a) as part of its Boulder Valley Monitoring Plan.

With the exception of arsenic in bedrock units, groundwater concentrations of all parameters generally are below Nevada's primary drinking water standards. Groundwater quality analytical results for wells remain virtually unchanged for the period of monitoring at Gold Quarry, Leeville, and Betze mines, with no discernable trend establishing degradation of water quality due to mining or other activities (Newmont 2007d; Barrick 2007a). Elevated arsenic concentrations in groundwater from some bedrock wells in the Study Area represent naturally occurring concentrations in deep mineralized zones.

Surface Water Quality

Surface water quality analytical results for samples in the Study Area remain virtually unchanged for the period of monitoring, with no discernable trend establishing degradation of water quality due to mining or other activities (Newmont 2007d; Barrick 2007a).

The Humboldt River and several tributary streams in the Study Area are listed as impaired on the U.S. Environmental Protection Agency's (USEPA) 2004 303(d) list of impaired water bodies (NDEP 2005). With respect to the Study area, the Humboldt River is designated as impaired from Palisade to Battle Mountain, with the pollutants of concern listed as iron, phosphorus, total suspended solids, turbidity, and zinc (dissolved). Maggie Creek is listed for phosphorus and pH; Simon Creek is listed for total dissolved solids; and Willow Creek is listed for mercury (dissolved) (NDEP 2005). To date, NDEP (2005) has established Total Maximum Daily Loads (TMDLs) for total phosphorus and total suspended solids for the Humboldt River from Palisade to Battle Mountain.

CUMULATIVE EFFECTS

Cumulative effects on water resources can result from: (1) mine dewatering; (2) discharge of excess mine water; (3) land disturbance; (4) development of pit lakes; (5) grazing activities; (6) replacement of riparian/wetland plant communities with invasive non-native plants; and (7) wildfires. These activities can affect surface water and groundwater quantity and quality in the Study Area (BLM 2000)

Water Quantity

Newmont's Gold Quarry and Leeville mine projects and Barrick's Betze/Post and Meikle mines account for most of the dewatering projected to occur in the foreseeable future in the Study Area. The combined cones-of-depression in groundwater created by dewatering would create additive effects in regional groundwater drawdown.

Numerical groundwater models used to predict the maximum extent of cumulative groundwater drawdown, and results of those models, are included in the CIA report (BLM 2000), and in EIS documents for SOAPA and Leeville (BLM 2002a, 2002b). The groundwater model is periodically calibrated and updated using more recent hydrologic data. The most recent model update (HCI 2007a) shows that the maximum extent of the predicted 10-ft drawdown contour line or isopleth due to all Carlin Trend dewatering will be smaller than those predicted previously for the SOAPA EIS (BLM 2002a), Leeville Project EIS (BLM 2002b), and the CIA report (BLM 2000).

Figure 3-2 shows the maximum extent of 10-ft drawdown depicted for the Leeville EIS (BLM 2002b) and the updated modeled drawdown area presented by HCI (2007a). The reduced size of the HCI (2007a) updated groundwater drawdown area is primarily in the northern portion into the Tuscarora Mountains and in the southern portion across Marys Mountain.

As previously noted, dewatering from the Hollister Development Block Project (underground decline) has not been included in the groundwater models; however, the effect of the low dewatering rate (350 gpm) would not have a measurable influence on cumulative groundwater drawdown in the Study Area.

Surface Water Flows

Few surface water flow impacts (including those to streams, rivers, and springs) resulting from mine dewatering in the Study Area have been documented in approximately 15 years of monitoring. As discussed in the CIA report (BLM 2000), flow in some stream reaches could be reduced as a result of mine-induced drawdown, including lower Maggie Creek, lower Marys Creek, lower Susie Creek, Rock Creek, and Boulder Creek.

The most recent groundwater model update by HCI (2007a) for all Carlin Trend mine dewatering share the following effects on the Humboldt River and tributary streams in the Study Area relative to predicted effects disclosed in the SOAPA EIS (BLM 2002a) and Leeville Project EIS (BLM 2002b).

- Less decrease of base flow in Marys Creek, Maggie Creek, and the Humboldt River.

- Lower Maggie Creek impacts are similar to those predicted in the EISs. During mining operations at Gold Quarry, base flow would increase due to dewatering discharge, varying from about 3 to 35 cubic feet per second (cfs). After this period of discharge, natural base flow conditions of no flow would resume.

- Magnitude of decreases in lower Susie Creek flow are identical to those predicted for the EISs, but the length of time that mine dewatering may affect lower Susie Creek has been extended by 30 years.

- Marys Creek is predicted to have a smaller decrease in base flow than was predicted in the EISs (base flow of about 2.5 cfs reduced to 1.0 cfs prediction versus reduction to 1.6 cfs for updated model prediction).

- Beaver Creek base flow is predicted to have a decrease similar to that predicted in the EISs; the decrease is relatively minor (0.05 cfs).

- Based on results of the updated 2007 Carlin Trend model, the addition of Leeville Mine pumping in 2003 would have less than 0.1 cfs incremental decrease in base flow impact on creeks and rivers in the Study Area.

- Base flow in the Humboldt River at Dunphy would decrease by a maximum of 3.4 cfs after cessation of mine dewatering in the Carlin Trend; this is a reduction of impact previously predicted in the EISs (predicted reduction of about 4.5 cfs) and the Cumulative Impact Analysis (BLM 2000) report (predicted reduction of about 8 cfs). As previously discussed, Humboldt River base flow will increase during periods of excess mine water discharges to the river.

To date, surface water flow impacts resulting from mine dewatering have not been documented in approximately 15 years of monitoring with the following previously documented exceptions:

- Brush Creek: Reduced flow and drying of springs and stream flow, and effects on vegetation have been noted along portions of Brush Creek since 1993 (BLM 2000). Bush Creek is a tributary of Rodeo Creek in the Boulder Valley.

- Maggie Creek at Narrows: Beginning in the 1990s, dewatering associated with the Gold

Quarry has affected flows in the narrows of Maggie Creek (BLM 2002a), with continuing reductions in observed flows (Newmont 2007d).

Trigger values for in-stream flow volumes that would require augmentation of flow as defined in mine site mitigation plans have not been reached to date, and therefore, no augmentation of in-stream flow has been required. Adverse effects to some surface water rights may occur if flow reductions occur in Study Area streams and/or the Humboldt River.

Predicted groundwater withdrawals for the TS Power Plant are not expected to have a measurable change on Humboldt River flows (ENSR 2004b; HCI 2007b). A model performed by HCI (2007b) shows a predicted decrease of 0.24 cfs or 110 gpm in Humboldt River flow between the Palisades and Battle Mountain gages due to pumping for the power plant. Average groundwater pumping for the power plant would be approximately 5.3 cfs or 2,400 gpm for its expected 50-year life (HCI 2007b).

Spring/Seep Flows

Based on the CIA (BLM 2000), a total of 182 springs in the Study Area could potentially be impacted by mine dewatering in the Carlin Trend. Review of flow data indicates no substantial change in flow rates for 28 of the 33 springs currently monitored by Newmont in the vicinity of the Gold Quarry and Leeville mines. Four springs have exhibited variation in flow, reduction in flow, or have gone dry for one or more years. Groundwater monitoring has not indicated any drawdown from mine dewatering operations in the direction of these springs. Hydrologic investigations have identified grazing, evolving streambed morphology, and anthropogenic flow controls as the primary factors influencing flow measurements at these springs. One spring exhibited an increase in flow since 2001 due to relocation of its monitoring point in accordance with the Maggie Creek Basin Monitoring Plan (Newmont 2007d). Fourth quarter 2005 monitoring by Barrick for the Betze/Post mine area indicated only three of the 23 springs monitored within the study area had gone dry due to mine dewatering activities (AATA 2006).

It is expected that fewer springs/seeps could potentially be affected by cumulative groundwater drawdown than were originally identified in the CIA report (BLM 2000). All springs and seeps determined as being potentially affected by groundwater drawdown are located below an elevation of approximately 6,000 feet. The updated numerical groundwater flow model (HCI 2007a) shows a smaller projected drawdown area as compared to previous versions of the model. The areas eliminated from predicted groundwater drawdown are located in south and west of the Gold Quarry Mine (Marys Creek, James Creek, and Welches Creek areas), and east of Susie Creek (HCI 2007a).

Of the seeps and springs that could potentially be impacted from cumulative drawdown, analysis of the groundwater drawdown model projected that five of these springs may be incrementally impacted by SOAPA dewatering (BLM 2002a). No incremental impact to springs/seeps would occur as a result of mine dewatering at Leeville (BLM 2002b). None of the five springs potentially impacted by SOAPA would qualify as a PWR 107 water right since four of the springs occur on private land, and the water right for the remaining spring pre-dates PWR 107. Additionally, both Barrick and Newmont have obligations to mitigate loss of flow from mine dewatering at selected springs/seeps in the cumulative drawdown area.

Groundwater Levels

As previously discussed, the most recent groundwater model update (HCI 2007a) shows that the maximum extent of the predicted 10-ft drawdown isopleth due to all Carlin Trend dewatering will be smaller than those predicted previously for environmental assessments in the Carlin Trend (**Figure 3-2**).

Continued mine dewatering at Gold Quarry through year 2015, Betze through 2010, and Leeville through 2018 will result in continued expansion of the cumulative groundwater cone-of-depression beyond its current configuration (HCI 2007a). These rates of groundwater drawdown from 2000-2007 are generally less than rates that occurred prior to 2000 when dewatering was initiated. Prior to 2000, pumping rates typically were higher in order to achieve sufficient lowering of the groundwater table to keep the advancing mine pits and underground workings relatively dry. Dewatering at Leeville did not start until 2003; however, groundwater in this area was already being lowered at that time due to the nearby Betze Mine operations.

Maximum groundwater drawdown resulting from projected pumping at the TS Power Plant in Boulder Valley is predicted to be about 19 feet by year 2057. Average pumping rate for power plant makeup water would be about 2,400 gpm from wells located in Boulder Valley (ENSR 2004b).

To date, groundwater drawdown measured in piezometers MK-1, MK-2, and CV-10, located north of SOAPA in alluvium or valley fill deposits (i.e., Carlin Formation) has been less than 10-feet. No other drawdown has been recorded in valley fill deposits.

Impacts to groundwater rights associated with wells may occur where water levels decline such that water yield is reduced or a pump must be lowered to keep it in water. Water rights are administered and protected by the State Engineer.

Water Quality

Runoff and drainage from waste rock storage facilities, leach pads, tailing impoundments, process ponds and other mine-related facilities could potentially impact both surface or groundwater quality in the Study Area. To date, with the exception of Hollister Development Block Project, none of the water monitoring stations in the Study Area has reported evidence of acid-rock drainage or elevated levels of metals. The South overburden stockpile at Hollister has generated acid in the past. Conditions that created the acid drainage have been addressed through a combination of improved surface water control measures that divert water that once reported, in part, to the stockpile, re-contouring to maximize shedding meteoric water, incorporating lime into cover material used to cap the stockpile, and installation of a collection and treatment system. Residual flow from the stockpile has elevated sulfate levels; this water reports to a constructed wetland where the water is consumed.

Acid-rock drainage has occurred at refractory ore stockpiles at Newmont's South Operations Area. This drainage is captured and used in ore processing. Refractory ore stockpiles may be a source of acid drainage over the life of the operation, but these stockpiles will be removed prior to project closure and, therefore, have a relatively short-term potential for producing acid drainage. Runoff or drainage from permanent facilities in the Study Area is unlikely primarily due to encapsulation of any identified potentially acid producing rock. Future impacts to surface water would likely be recorded at one of the many water quality monitoring sites within the Study Area. To date, no evidence of acid rock drainage has been recorded in water

monitoring programs being conducted in the Study Area. Monitoring results are presented in Water Pollution Control Permits (Newmont 2007i; Barrick 2007c), Maggie Creek Basin Monitoring Plan (Newmont 2007d), and Boulder Valley Monitoring Plan (Barrick 2007a) reports.

Erosion of mine-related land disturbances can result in increased sedimentation to surface water bodies in the Study Area. All mine projects have storm water permits that incorporate best management practices (BMPs) to control erosion and capture runoff from disturbed areas. No data have been collected to quantify sediment loss from mine areas. NDEP conducts regular inspections of sediment control systems to ensure compliance with storm water permits. Reclamation of disturbed areas during and after mining will manage potential long term erosion and sedimentation from mine sites.

Wildfires and flooding, especially between 2001 and 2006, have resulted in impacts to riparian areas of Maggie (including Beaver Creek) and Susie creek drainages. These conditions generally result in increased erosion and sedimentation to the nearby surface water drainages. Other water quality impairments specified in Nevada's 303(d) List for Maggie Creek (phosphorus and pH), Simon Creek (total dissolved solids), and the Humboldt River (iron, phosphorus, and zinc) will be addressed by NDEP when Total Maximum Daily Load limits are established.

Impacts to water quality within the Study Area also occur as a result of agricultural use. Grazing along stream corridors can result in a loss of bank stability, erosion, and sedimentation. Impacts to water quality include increasing suspended solids and turbidity, increasing temperature, decreasing riparian vegetation, and a variety of other effects (see *Riparian Areas and Wetlands* section in this Chapter). Diversion of water for irrigation also potentially impacts water quality by increasing water temperature, as well as introducing a number of agricultural contaminants via return flow.

Other non-mining land uses such as recreation and transportation also contribute cumulatively to water quality impacts. These activities add to surface disturbance which increases potential of erosion and sedimentation of surface water resources.

Development of mine pit lakes and saturation of underground mine workings after cessation of mining have the potential to cumulatively impact groundwater quality in the Carlin Trend. Concentrations of total dissolved solids, sulfate, nitrate, and some metals may be elevated, at least in the short-term, for water that comes into contact with some mine pit walls and underground workings. These water quality conditions can be quite variable, depending on local conditions, including rock type, mineral composition, exposure to weathering, amount of rock submerged below the water surface, presence of potentially acid-generating rock, chemical equilibrium conditions, and pit lake turn-over. Comprehensive monitoring of evolving pit lake chemistry will be conducted by the mine operators.

Pit lakes that ultimately develop in the Gold Quarry and Betze/Post pits are not expected to discharge to ground surface and, therefore, would not directly affect surface water quality. Additionally, these pit lakes are expected to be long-term hydraulic sinks due to high evaporation rates and relatively low groundwater inflow rates when filled, thereby preventing potential impacts to surrounding groundwater quality.

For the Study Area, inflowing groundwater to pit lakes typically have sufficient alkalinity to maintain neutral pH conditions for the long-term (i.e., high buffering capacity). In addition,

most underground workings will be backfilled with cemented rock aggregate consisting of neutral or acid-neutralizing material. Evaporation from the pit lake surface generally would concentrate levels of total dissolved solids, sulfate, and other major ions in the water. Precipitation of ferric hydroxide in pit lakes, however, acts to continually remove some metals from solution.

Two new geochemical predictions of pit lake quality have been performed in the Study Area since 2002. Geochemical modeling by Geomega (2007) predicts that the Tara pit lake would have a near-neutral pH, arsenic concentrations less than influent groundwater, and antimony concentrations less than the Nevada municipal domestic supply standard. The lake will not form until around year 2136 and will have consistently good water quality, comparable to existing groundwater in the Carlin Trend. A study of the Betze/Post pit lake predicts that water would have a near-neutral pH, with the possible exception of acidic conditions during the early period of pit lake filling (BLM 2003). Also for the Betze/Post pit lake, concentrations of total dissolved solids, sulfate, and antimony are predicted to exceed drinking water standards (BLM 2003).

Pit lakes are not intended to be used for drinking water (humans and livestock), recreational swimming, or fisheries. Therefore, water quality standards for drinking water, livestock use, recreational use, and aquatic life are generally not applicable to pit lakes. These water bodies, however, could be accessed by waterfowl and wildlife. An evaluation of potential impacts to these receptors for the Betze/Post pit indicates that ingestion of pit lake water by waterfowl or wildlife would not result in adverse effects (BLM 2003).

Restoration Projects

Water quality improvements due to stream and habitat restoration efforts are documented in the site monitoring programs and reports. An example is total suspended solids (TSS) versus stream flow in Maggie Creek, where TSS has been lowered over time, likely as a result of re-vegetation and stabilization of stream banks. This in turn, improves habitat quality for aquatic life and sediment sensitive species such as Lahontan cutthroat trout.

Improvement and expansion of riparian/wetland in the Maggie Creek drainage due to the Maggie Creek Watershed Restoration Project has occurred since implementation of the program. Development of healthy, well-developed riparian zones in the Maggie Creek drainage has slowed water and dissipated energy during periods of high flow (Trout Unlimited 2007b), resulting in capture of sediment, development of floodplains, and overall habitat improvement. Reduced sediment loads reflect improved filtering capacity of a healthy, well-established riparian zone. Flooding in 2005 and 2006 caused erosion of streams throughout the Study Area; however, habitat improvements in the Maggie Creek drainage tended to moderate impacts.

The Upper Willow Creek Habitat Enhancement Plan enhancement area (including Willow, Lewis, and Nelson Creeks) is within the vicinity of, but external to, the area of potential impact from mine dewatering (CCA 2004). This Habitat Enhancement Plan has resulted in a watershed with improvements for aquatic organisms and sediment levels in the Willow/Rock Creek drainage (CCA 2004). Setbacks were experienced in 2005 and 2006 due to range fires and flooding.

SOIL RESOURCES

Information on soil resources in the Study Area is developed on a project specific basis through soil surveys. Surveys include various levels of intensity depending on whether a specific tract of land is to be disturbed by the proposed mine

development. Soil survey information is described in Plan of Operations submitted by mine applicants and includes the texture of the soil, depth or thickness, chemistry (including organic matter content), coarse fragment content, aerial extent of each soil type (map), and suitability rating of the soil for reclamation.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for soil resources encompasses the Carlin Trend and watersheds that drain the Carlin Trend to the confluence with the Humboldt River. This Study Area is based on natural and manmade impacts to soil resources that result in soil movement or loss, soil fertility and productivity, and areas where additive effects of soil movement could impact other resources (e.g., surface water). The Study Area for Soil Resources is shown on **Figure 3-3.**

MONITORING DATA AND NEW INFORMATION (2002-2007)

Additional soil data have been collected in the Study Area since 2002 in association with the TS Power Plant located in Boulder Valley.

TS Power Plant

The majority of soil located in the 600-acre TS Power Plant site is mapped as Dunphy, which is a silt loam that varies between slightly saline to strongly saline. This soil is usually in excess of 60 inches deep, moderately well-drained, and has a slight to moderate water and wind erosion hazard (USDA 1980).

Other soil types that would be affected by the power plant development range in texture from silty clay to loams to silty loam to gravelly and fine sandy loams. These soil types include non-saline to strongly saline and alkali. Soil depths range from 12 to 60+ inches.

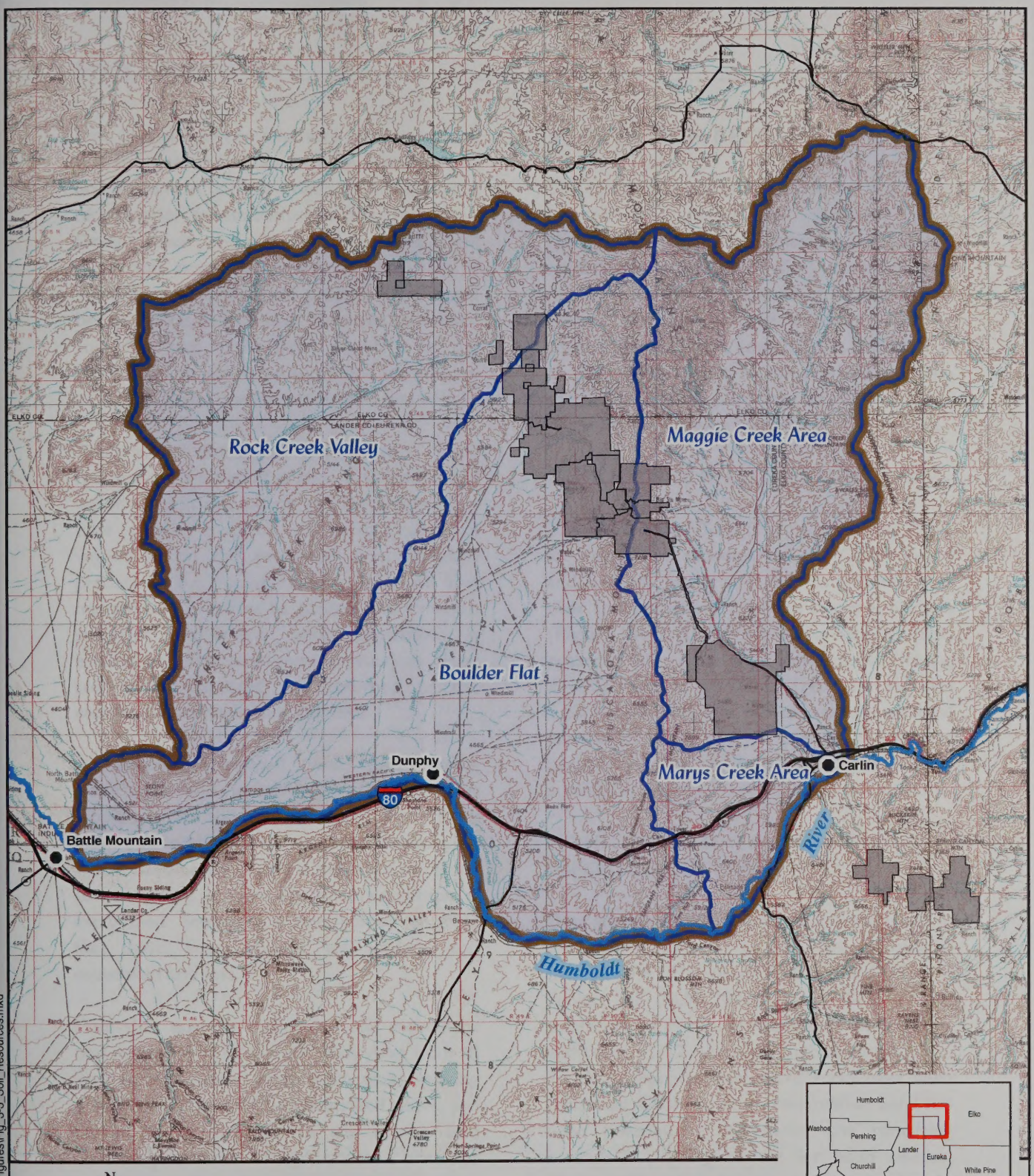
CUMULATIVE EFFECTS

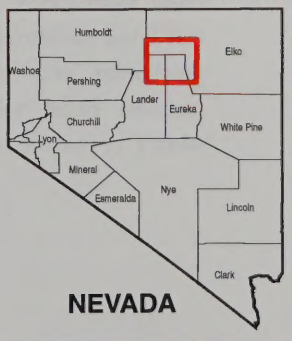
Soil resources are cumulatively impacted through disturbance and/or removal by mining, fire, agriculture, recreation, and a variety of other natural and man-caused activities within the analysis area. These impacts are described in terms of the type of impact and the number of acres affected. Consideration is also given to the amount of those acres which are likely to be reclaimed.

Tables 2-1 and **2-2** in Chapter 2 –*Mine and Mineral Development,* provide information on past, present, and reasonably foreseeable activities in the vicinity of the Carlin Trend. Mining and livestock grazing are expected to continue as major activities in the Study Area and impacts to soil resources from wildfire in the area would also continue to occur. Impacts from these activities include loss of soil productivity due to changes in soil physical properties, soil fertility, soil movement in response to water and wind erosion, and loss of soil structure due to compaction

In addition to mining activities in the Study Area, several years of major wildfires have occurred, creating additional regional impacts to soil. Burned areas with damaged or destroyed vegetation are susceptible to soil erosion by wind and water. Emergency and remedial seeding has taken place in order to minimize soil erosion and stabilize surfaces. An undetermined amount of soil has eroded into drainages and waterways as a result of fire. Movement of soil from burn areas is dependent on weather conditions, duration of exposure, and success of seeding efforts to establish vegetative cover.

Mine construction and development practices in the Study Area include salvage and stockpile of soil for use in reclamation. Topsoil stripping occurs immediately following clearing and grubbing of the surface area and therefore, the





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Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries
- Hydrographic Sub-basins
- Cumulative Effects Study Area

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CUMULATIVE EFFECTS STUDY AREA
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FIGURE
3-3

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time period between exposure of bare mineral soil to wind and water erosion is minimized. Soil movement is most evident from stockpiles of soil prior to establishment of cover crops. Once cover crops are established, soil movement from the surface of stockpiles is minimized. Also, standard practice is to install berms at the toe of each stockpile to collect soil that may move from the face of the stockpile. This soil is captured and is returned to the stockpile; resulting in minimal loss of soil.

Similarly, redistribution of soil during reclamation is a period of time where wind and water erosion can initiate soil movement. This time period is prior to establishment of vegetation on the reclaimed area. Standard practice in the mining industry is to use best management practices to control and minimize sediment movement until vegetation is established. Best management practices allow soil to be captured and returned to the reclaimed area minimizing soil loss.

Reclamation associated with past mining disturbance and future restoration activities would mitigate soil movement and productivity loss. Soil salvaged and used in reclamation would become viable and is expected to return to pre-mining productivity once vegetation is established. Seeding and revegetation of areas that have been burned will reduce soil movement and loss.

Data that quantify cumulative soil movement that result in soil loss in the Study Area from all land surfaces (mine areas, burn areas, grazing areas) are not available. As described above, soil movement in response to any of the land disturbing activities or phenomena are site specific, weather dependent, and subject to response to the timing and success of rehabilitation efforts.

VEGETATION RESOURCES

The cumulative effects discussion for vegetation focuses on changes in dominant plant communities that effect habitat for wildlife (i.e., sagebrush/grasslands). Wildfires combined with displacement of native species by invasive annual grasses are the primary factors that have altered the structure, composition, and ecology of plant communities in the Study Area. One species of sensitive plant that may be present in the Study Area, Lewis buckwheat, is addressed.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for vegetation encompasses the Carlin Trend and extends north and east to include mule deer and pronghorn antelope seasonal habitats (**Figure 3-4**). The Study Area includes past, present, and reasonably foreseeable mining developments in the Carlin Trend and includes a contiguous area that provides crucial seasonal habitat for mule deer, a species of concern because of loss of habitat associated with cumulative impacts on vegetation from wildfires.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Data and discussions of vegetation resources in the Study Area prior to 2002 are available in the SOAPA EIS (BLM 2002a) and Leeville Project EIS (BLM 2002b). Since 2002, mining operations in the Study Area have resulted in an additional 7,312 acres of surface disturbance. To date, approximately 1,676 acres have been reclaimed. Of these acres, reclamation bond has been released on 62 acres; the remaining acreage is pending review for bond release. Mining related disturbances are shown in **Table 2-1** in Chapter 2.

Since 1999, wildfires have burned nearly 942,000 acres of sagebrush and grassland habitat as shown on **Figure 2-4**. Areas damaged by wildfire and efforts to mitigate effects of fire are described in Chapter 2 – *Wildfires and Reseeding.*

CUMULATIVE EFFECTS

The primary past, present, and reasonably foreseeable changes that have affected vegetation in the Study Area include wildfires, mining and exploration activity. Existing mining and exploration projects are listed in **Table 2-1** and reasonably foreseeable mine development in the Carlin Trend from 2007 to 2020 is shown in **Table 2-2**.

Reclamation of mine-related disturbance in the Study Area will be incremental as various operations reach the end of mining and begin closure activities. Approximately 35,500 acres of mine disturbance is projected for the Study Area, of which about 6,200 acres would remain as open pits; some pits would be partially filled with water. Approximately 29,300 acres would be reclaimed to pre-mining conditions (BLM 2002b). Areas affected by mining on public land will be reclaimed to BLM standards and monitored to assess success of reclamation.

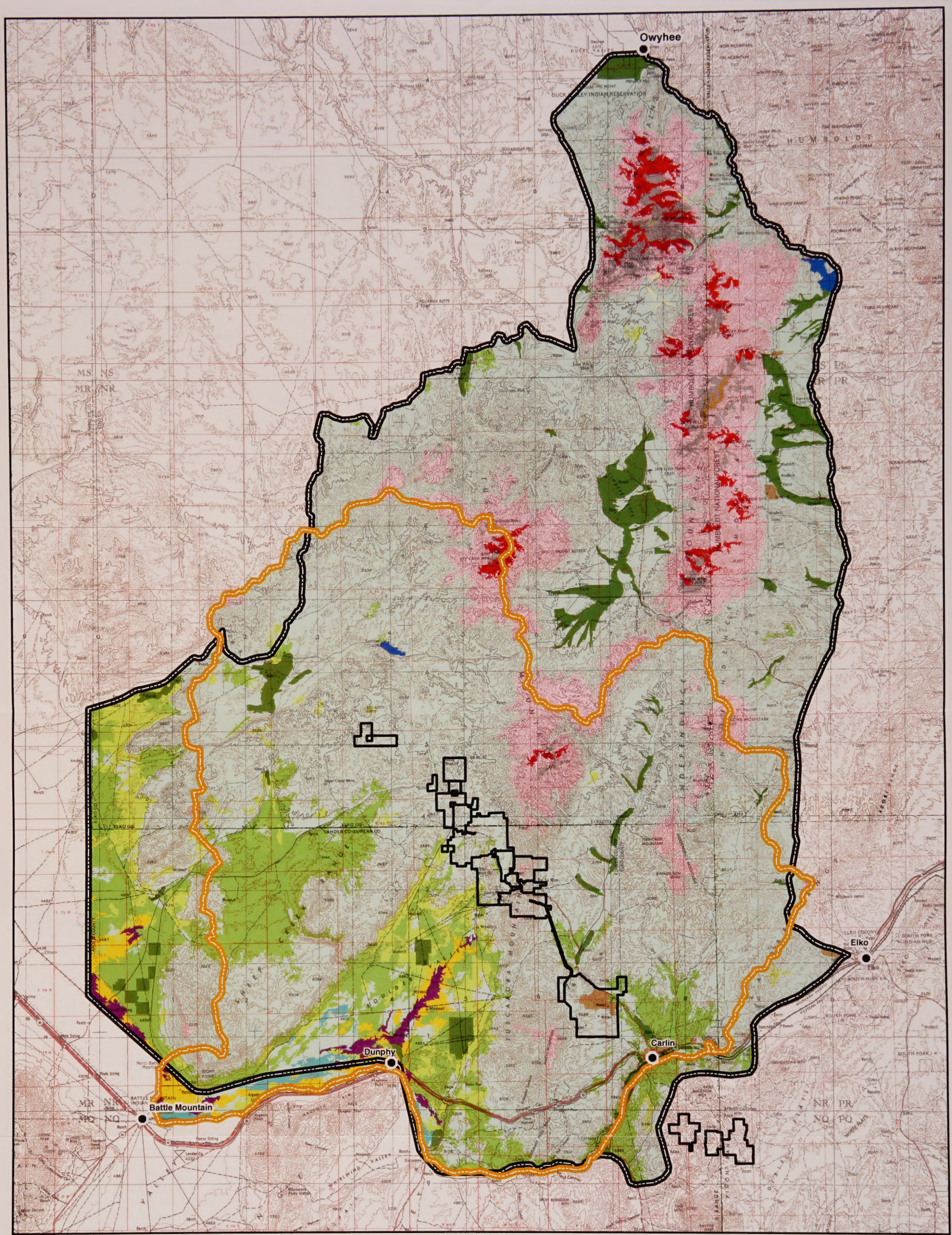
Vegetation on reclaimed areas likely would be dominated by grasses with low densities of native forbs and shrubs. Typically, communities of big sagebrush, the most extensive pre-mining plant community, have proven difficult to re-establish on reclaimed land (Schuman and Booth 1998; Vicklund *et al.* 2004). Establishment of big sagebrush on reclaimed land has been shown to benefit from application of mulch, inoculation with arbusucular mychorrizae, reduced competition with herbaceous species (lower seeding rate of grasses and forbs), and direct-placed topsoil (Schuman and Booth 1998). Arbuscular mychorrizae are soil fungi that form a symbiotic relationship with roots of sagebrush and other plants, which improves drought tolerance. Arbuscular mychorrizae are lost when topsoil and other growth media are stockpiled.

Most reclamation plans do not specify measures that favor establishment of big sagebrush over herbaceous species; consequently, plant communities that develop on reclaimed land would likely be dominated by herbaceous species. Once a dense cover of herbaceous species has developed, it is unlikely that natural colonization by big sagebrush would successfully increase sagebrush densities to pre-mining levels. Sagebrush seedlings do not compete effectively with grasses and forbs. Mitigation measures to enhance re-establishment of sagebrush would increase the density of sagebrush on reclamation sites and decrease the time required to establish sagebrush communities comparable to pre-mining levels.

Although post-mining vegetation may have lower densities of sagebrush and other shrubs than pre-mining vegetation, it is likely that stable and self-sustaining plant communities would develop on reclaimed land. Ross (2000) reports that successful revegetation is the norm even in the driest, hottest parts of Nevada and there is no area in the state where perennial native species have not been re-established after mining, at a cover and density equal to or greater than that of undisturbed areas.

Disturbed sites and recently seeded areas are candidates for invasion by undesirable species such as noxious weeds and cheatgrass. Aggressive revegetation and weed control programs are being implemented to prevent establishment of weed infestations on reclaimed sites.

Wildfires will continue to be a major factor in replacement of shrub communities by grass-dominated communities, often with a high cheatgrass component. The cumulative effect of



SOURCE: LANDCOVER-LAND USE LAND COVER (LULC) DATA, USGS; USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

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VEGETATION RESOURCES - CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
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Eureka and Elko Counties, Nevada

FIGURE
3-4

fires within the Study Area is more pronounced because of the increased size and intensity of recent wildfires.

The general effect in some areas of recent fires has been conversion of primarily sagebrush habitat to expanses of cheatgrass, which form a persistent, non-native, monoculture that dominates some burned areas. The continued establishment of cheatgrass will increase the likelihood of wildfire, and could change the fire regime, community composition, and structure of plant communities indefinitely. Locally and regionally, wildfires have reduced the density of shrubs and trees. Many of the woody species in the area are slow growing, requiring 15 to 20 years to re-establish.

Reseeding within the Study Area (see Chapter 2 – *Wildfires and Reseeding*) will improve vegetation structure and composition in burned areas and benefit wildlife by providing forage, cover, and nesting habitat. Large areas affected by fire may take years to re-establish native vegetation. Completed and planned sagebrush and forage planting in burned areas will benefit a diversity of wildlife species including mule deer, pronghorn, sage grouse, and pygmy rabbit by providing forage, cover, and breeding habitat.

Livestock grazing has and will continue to influence vegetation composition and structure throughout the Study Area. Potential for overgrazing may increase as land is converted to mining and transportation uses or temporarily lost to wildfire; however, adjustment of stocking rates to account for changes in land use ensures vegetation communities are not overgrazed (see *Grazing Management and Agriculture* in this Chapter). Within the Study Area, reductions in permitted grazing use has and will continue to occur as a result of mine development and wildfires; however, these impacts will be short term as subsequent reclamation of mined areas and restoration of burned sites will allow for stocking rates to return to near pre-mining/pre-burn levels.

Special Status Species

Lewis' buckwheat (*Eriogonum lewisii*) is the only sensitive species with suitable habitat in the Study Area; although it has not been documented on any sites affected by mining. The plant occurs on dry, open ridges at elevations of 6,470 to 9,720 feet. Mining activities in the Carlin Trend occur below the elevation range of this plant and have not affected it or its habitat. Widespread wildfires could pose a risk to this species; however, habitat on which it occurs does not usually support intense fires that would harm this plant.

Invasive, Non-native Species

Cumulative effects on invasive and non-native species result from wildfire, livestock use, and mining disturbance. Grazing, while reduced to accommodate conversion of rangeland to active mine operations or as a result of wildfires, will continue in the area. Continued mine exploration and expansions and wildfires open niches for invasive plant colonization and provide a means of seed transport along roadways and trails. With continued activities that disturb soil and vegetation, the potential for areas to be colonized by noxious weeds and other invasive species will increase.

An estimated 8,000 acres on public and private land within the Study Area are infested with Scotch thistle, while more than 1,000 acres are affected by hoary cress (short white top). Smaller infestations of Russian knapweed and Canada thistle are scattered along roads and drainages. The McCann Creek drainage in the northern portion of the Tuscarora Mountains is experiencing an epidemic of hoary cress spreading into creek bottoms and uplands. The spread of weeds results in displacement of native vegetation vital to wildlife (Coca 2007).

Treatment programs to control noxious weeds are being implemented by BLM and private land owners. Since 2002, BLM has treated approximately 2,500 acres of Scotch thistle annually. Newmont treated 1,233 acres and 1,694 acres during 2005 and 2006, respectively, for Scotch thistle, salt cedar, and hoary cress. Treatment areas ranged from the Bootstrap Mine in the North to the Rain Mine in the South (Basin Tree Service and Pest Control, Inc. 2005, 2006).

While area ranches and mines are applying both chemical and biological control techniques, control is inadequate to keep up with the rate of spread, and adverse impacts to rangeland including upland and riparian areas are expected to increase (Coca 2007).

TERRESTRIAL WILDLIFE, T&E, CANDIDATE, AND SENSITIVE SPECIES

The cumulative effects discussion for wildlife emphasizes potential effects to mule deer, pronghorn antelope, elk (important big-game animals) and special status species (e.g., threatened, endangered, candidate, and sensitive species) for which reductions in important habitats (primarily sagebrush-grassland) have affected populations within the Study Area. Other terrestrial species associated with sagebrush-grasslands that occur within the Study Area include small mammals, passerine birds, waterfowl, and raptors, as well as amphibians, reptiles, and invertebrates. These species are described in detail in the SOAPA EIS (BLM 2002a).

CUMULATIVE EFFECTS STUDY AREA

Big Game Animals

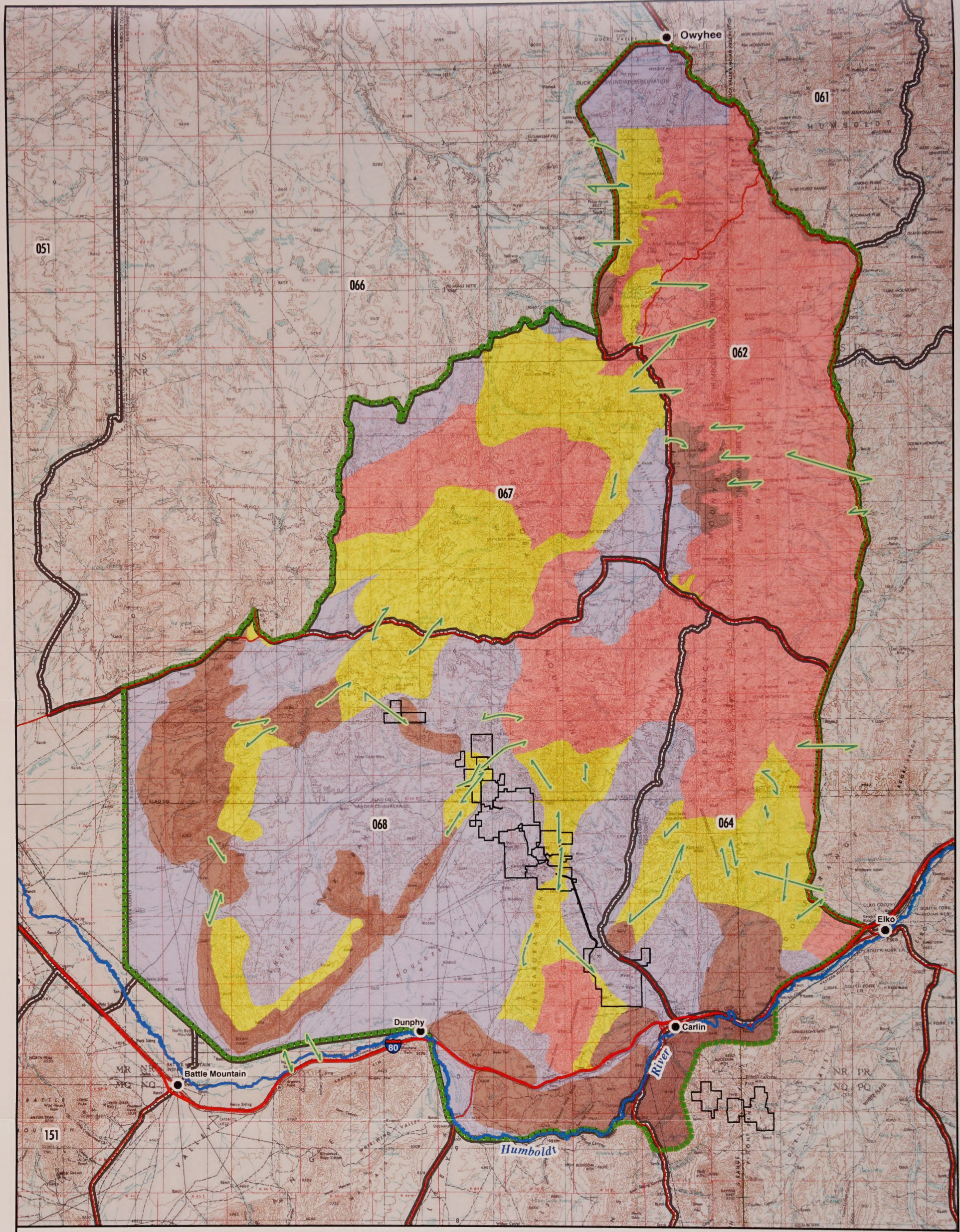
The Cumulative Effects Study Area (Study Area) for mule deer, antelope, and elk encompasses a portion of NDOW Wildlife Management Area 6 depicted in **Figure 3-5** and **Figure 3-6**. The Study Area was determined by BLM and NDOW and includes a contiguous area that provides crucial seasonal habitat for mule deer, a species of concern because of habitat losses associated with wildfires and mining. The Study Area extends from the northern end of the Independence Range in the North to the Humboldt River and northern end of the Piñon Range to the South.

Elk were first observed in the Independence Mountains portion of the Study Area in the mid-1980s and have increased to a population of approximately 290 animals (Wilkinson 2007a). Elk have been observed moving from the Maggie Creek Narrows to forage on adjacent reclaimed areas. Typically, elk are present in winter on Bob's Flat and Richmond Mountain near the southern end of the Tuscarora Mountains. Seasonal migration routes and timing of migration have not been well documented although some elk migrate to Marys Mountain during summer (Lamp 2007).

Special-Status Species

Special-status species are identified as those listed or proposed for listing as threatened or endangered under the Endangered Species Act (ESA), species that are candidates for listing under the ESA, species that are on BLM's list of Sensitive Species and State of Nevada Listed Species. Nevada BLM policy is to provide Nevada BLM Sensitive Species and State of Nevada Listed Species with the same level of protection as is provided for candidate species in BLM Manual 6840.06C.

The Study Area for special-status species includes hydrographic basins that could be affected by mining in the Carlin Trend (**Figure 3-4**). This area encompasses habitat that would have potential to be affected by drawdown from mine dewatering and therefore, potentially impact species described below.



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

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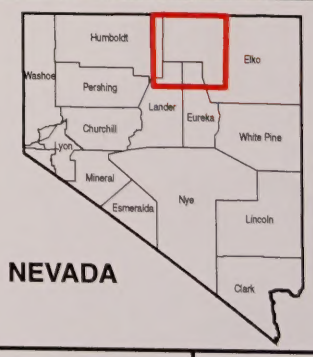
Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries

Mule Deer Habitat

- Summer
- Intermediate
- Crucial Winter
- Low Density

- Deer Migration Corridor
- Terrestrial Wildlife Cumulative Effects Study Area
- NDOW Unit Boundaries



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TERRESTRIAL WILDLIFE - MULE DEER HABITAT - CUMULATIVE EFFECTS STUDY AREA
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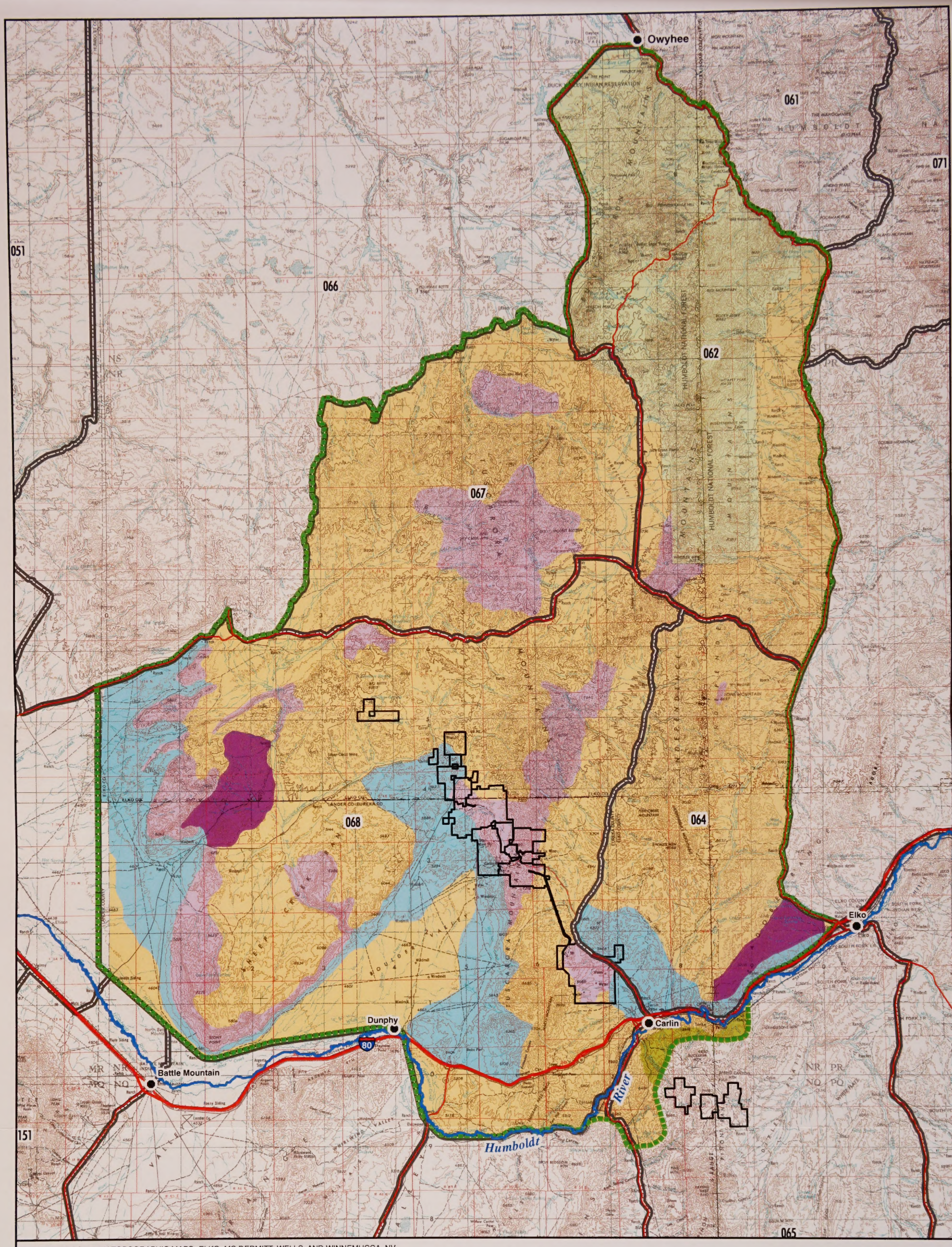
FIGURE
3-5



SOURCE: USGS 1:250K TOPOGRAPHIC MAPS--ELKO, MC DERMITT, WELLS, AND WINNEMUCCA, NV.

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Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Highway
- Plan Boundaries
- NDOW Unit Boundaries
- Terrestrial Wildlife Cumulative Effects Study Area

Antelope Habitat

- All Year
- Crucial Winter
- Intermediate
- Summer
- Low Density
- Unidentified

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TERRESTRIAL WILDLIFE - PRONGHORN ANTELOPE HABITAT
CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-6

Yellow-billed Cuckoo (Candidate for Federal Listing)

The yellow-billed cuckoo in western North America has undergone decline in population due to losses and degradation of riparian woodland habitats resulting from conversion to agriculture, overgrazing, and competition from exotic plants (Wiggins 2005). This species is closely linked with riparian woodlands, but has not been documented in the Study Area. One dead cuckoo was found at Ruby Lake National Wildlife Refuge in 1972 and constitutes the only recorded cuckoo in Elko County.

Bald Eagle (Delisted)

On June 28, 2007, the Secretary of the Interior announced that the bald eagle was being removed from the federal list of threatened and endangered species. The final rule delisting the bald eagle was published on July 9, 2007, and became effective on August 8, 2007 (72 FR 37346). After delisting, bald eagles will continue to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Since 1989, NDOW has conducted winter surveys for birds of prey within the sub-basins of Rock Creek, Boulder Creek, and Maggie Creek. Wintering bald eagles have been recorded during one or more of these surveys in each of the sub-basins, with two to six eagles using each area (BLM 2000).

Bald eagles usually winter near bodies of water because fish and waterfowl are common prey. In the absence of waterfowl and fish, bald eagles eat carrion or prey upon small mammals such as black-tailed jackrabbits (BLM 2002b).

Sage Grouse (BLM Sensitive species)

Greater sage grouse occur throughout the Study Area and are typically associated with sagebrush habitats in rolling hills and benches along drainages (BLM 2002a). Sage grouse habitat within the hydrographic basins that could be affected by mine development in the Carlin Trend is shown on **Figure 3-4**.

Pygmy Rabbit (Sensitive Species)

Pygmy rabbits are sagebrush obligates that prefer areas of relatively tall, dense sagebrush with deep soil suitable for excavating burrows. Sagebrush is the primary food of pygmy rabbits, but they also eat grasses and forbs depending on the seasonal availability. In Nevada, pygmy rabbits are generally found in sagebrush-dominated broad valley floors, stream banks, alluvial fans, and other areas with friable soil.

Other Sensitive Species

The following Sensitive Species and State of Nevada-Listed Species are reliant on water sources for direct life support and/or prey base:

- Preble's Shrew
- Swainson's Hawk
- White-faced Ibis*
- Black Tern
- Ferruginous Hawk
- Northern Goshawk
- Burrowing Owl
- Sensitive Bat Species (Spotted Bat, Townsend's Big-Eared Bat, Long-Legged Myotis, Western Long-Eared Myotis, Western Small-Footed Myotis, and Fringed Myotis)
- Loggerhead Shrike
- Nevada Viceroy.

* denotes State of Nevada-Listed Species

Details regarding the type of habitats and prey base for these species are described in the SOAPA EIS (BLM 2002a). As shown on **Figure 3-4**, the Study Area for these species includes the hydrographic basins that could be impacted by mine dewatering programs in the Carlin Trend.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Results of ongoing studies and monitoring efforts from 2002 to 2007 are summarized in this section. To date, mining and exploration operations in the Study Area have resulted in approximately 33,000 acres of surface disturbance of which approximately 1,676 acres have been reclaimed. Approximately 2,500 acres of additional disturbance are expected to occur from 2007 to 2020 in the Study Area (**Table 2-2** and **Figures 3-4, 3-5,** and **3-6**). (Note: The Emigrant and Rain mine areas are not included in the Study Area for this resource).

From 1999 to mid-July 2007 approximately 923,000 acres have been affected by wildfire in the Study Area for mule deer, pronghorn antelope, and elk. About 52,000 acres of habitat for these species lies within Plan boundaries for the various mine operations and exploration projects as shown on **Figure 2-7**. Actual disturbance (mining and exploration) since initiation of mining operations in the Carlin Trend within the Plan boundaries is approximately 33,000 acres. The difference (19,000 acres) between the Plan boundaries (52,000 acres) and actual disturbance (33,000 acres) encompasses undisturbed land that may or may not be accessible to wildlife. Some mine components such as heap leach facilities, tailing storage facilities, and mill sites are fenced to preclude access by wildlife. Not all Plan boundaries are fenced at the present time (exploration Plan boundaries and the Bootstrap project site, for example) so wildlife continues to have access to these areas.

Tables 3-8 and **3-9** show the number of acres that have been impacted by mining and wildfire in the Study Area.

Since 1999 to mid-July 2007, wildfire has damaged 571,797 acres of sagebrush-grassland habitat in the Study Area (**Table 3-10**). Wildfire has also burned portions of the Study Area prior to 1999. Approximately 383,000 acres have been seeded or managed for natural release (natural revegetation) to rehabilitate burned areas (see Chapter 2 – *Wildfires and Reseeding*). Canopy cover in some areas has been reduced. Forb and grass diversity has also been reduced and recovery of these plant communities will vary in terms of time and cover across the burned areas (see *Vegetation* section in this Chapter).

CUMULATIVE EFFECTS

Cumulative effects on wildlife in the Study Area have resulted primarily from wildfires, mineral exploration, mining activities, non-native invasive weeds, livestock grazing, drought, urbanization, and seeding of native range with introduced herbaceous species. Other industrial development activities in the area such as a power plant, transmission lines, and roads also contribute to impacts to wildlife.

Development of reasonably foreseeable mine projects and the TS Power Plant will continue to impact big game in the Study Area; however, mine areas proposed for development have been the site of human activity including exploration drilling and environmental monitoring programs or are within or adjacent to existing mine areas (Wilkinson 2007b). Wildlife has either moved from these areas or has become habituated to the activity and remains in the general area.

Wildfires and Mining

Within the Study Area, wildfire has created one of the primary cumulative effects on wildlife. Wildfire has resulted in the temporary to long-term loss of shrubs that provide forage and cover as habitat components, that has caused reductions in mule deer and antelope herds throughout the Study Area (see Chapter 2 – *Wildfires and Reseeding*).

TABLE 3-8 Effects of Mining and Fire on Mule Deer and Pronghorn Habitat			
Habitat	**Area (acres)**	**Area Included in Plan Boundaries (acres)**	**Area Effected by Fire (acres)**
Mule Deer			
Crucial Winter	333,593	1,097	232,745
Intermediate	484,813	11,030	239,624
Low Density Use	831,266	39,739	307,227
Summer	748,596	187	143,216
TOTAL	**2,398,268**	**52,053**	**922,812**[1]
% of Total		**2.2**	**38**
Pronghorn			
All Year	12,056	0	8,963
Crucial Winter	270,311	11,785	124,283
Intermediate	47,318	0	24,180
Low Density	253,069	28,988	110,395
Summer	1,453,240	11,280	631,491
Unidentified	344,214	0	16,499
TOTAL	**2,380,208**	**52,053**	**915,811**[1]
% of Total		**2.2**	**38**

[1] Includes Study Area for Terrestrial Wildlife and Special Status Species

TABLE 3-9 Percent of Mule Deer and Pronghorn Habitat Affected by Mining and Fire				
Habitat	**Mule Deer**		**Pronghorn**	
	Mining	**Fire**	**Mining**	**Fire**
Crucial Winter	< 1	70	4.4	46
Intermediate	2.3	49	0	51
Summer	< 1	18	< 1	43
Low Density	4.8	37	11	44
All Year	---	---	-1	74
Unidentified	---	---	0	4.8

TABLE 3-10 Acreage and Percent of Sagebrush Habitats Affected by Mining and Wildfire			
Vegetation Type	**Study Area Acres**	**Mining (%)**	**Wildfire (%)**
Mountain sagebrush	79,745	577 (< 1 %)	14,042 (17.6 %)
Sagebrush	198,117	2,535 (1.2 %)	78,545 (39.6 %)
Sagebrush/perennial grassland	925,214	46,020 (4.9 %)	479,210 (51.7 %)
Total	**1,203,076**	**49,132 (4 %)**	**571,797 (47.5 %)**

Source: BLM 2007a.

Mining has removed approximately 52,000 acres of wildlife habitat as a function of fencing and/or land disturbance associated with mining operations (**Table 3-8**). Mine dewatering programs could result in reduction or loss of flow in springs and seeps that support wildlife. Models predict that approximately 182 springs and seeps and associated wetlands may be affected by drawdown from mine dewatering (BLM 2000; HCI 2007a). Reductions or elimination of flow in springs, seeps, and streams from dewatering could impact wildlife species dependent on these sites (e.g., amphibians, springsnails, and birds) and may affect distribution of other species (e.g., bats, mule deer and pronghorn antelope) that use these sites as part of a larger habitat complex (see *Water Quantity and Quality* and *Fisheries and Aquatic Resources* sections in this chapter). Mitigation programs implemented by mining operations include obligations to maintain or augment flow in springs and streams that are import to wildlife species.

Riparian habitat rehabilitation and stabilization programs implemented since 1993 have resulted in an increase in acres and health of riparian and wetland areas in the Study Area (see *Stabilization and Rehabilitation Programs* section of Chapter 2). Reseeding of areas burned by wildfires are described in the *Wildfires and Reseeding* section of Chapter 2.

Potential effects of dewatering on surface water features are described in the *Water Quantity and Quality* section of this Chapter. Habitat improvement resulting from various plans and programs implemented in the Study Area are described in Chapter 2 –*Stabilization and Rehabilitation Programs.*

Big Game

Mule Deer and Pronghorn Antelope

Mining activity in the Study Area occurs on less than 1 percent of mule deer summer range, approximately 2.3 percent of intermediate range, and <1 percent of crucial winter range. Mining disturbances have also affected <1 percent of pronghorn summer range and approximately 4.5 percent of crucial winter range in the Study Area (**Table 3-9**). Migration corridors are specific areas within intermediate range which are used based on, but not limited to, factors such as vegetation types, topography, and elevation. Four main areas of intermediate range that contain migration routes connecting summer and winter range are located in the Study Area. While the overall percentage of affected habitat is small, maintaining mule deer migration corridors around and between the various existing and foreseeable mining projects is an issue of concern (Wilkinson 2007b).

Traditionally, mule deer migrated along both flanks of the Tuscarora Mountains to and from wintering areas. Little Boulder Valley served as an intermediate range staging area prior to movements. With the reduction in the quantity and quality of the mule deer intermediate range, mule deer currently tend to move through this habitat more rapidly, therefore, onto winter range earlier in the season (BLM 1996). With decreased availability and use of the intermediate range in the Study Area, increased demand is placed on forage on winter range areas.

Construction of mining projects in the Study Area has caused mule deer migration to shift to a corridor on the east side of the Tuscarora Mountains (Lamp 2007). Most deer migrating from the northern summer range to Dunphy Hills move east of the Leeville Mine and then south. Mining actions have impacted historic migration corridors in the southern portion of

the Tuscarora Mountains. Recently permitted plans of operation such as North Lantern and an amendment to the Pete Project and reasonably foreseeable actions such as Barrick's proposed expansion and Lantern III continue to reduce these migration corridors (Wilkinson 2007b). This has effectively reduced an historic 10- mile wide area on the Tuscarora Mountains which provided mule deer intermediate range (spring, fall) and migration corridors to less than a 0.5-mile wide area near the Pete Project. Encumbrances to mule deer movements, including, mineral exploration activities; livestock control fences; the North-South Haul Road ("deer ramps" were included as a feature to mitigate effects), top soil stockpile(s) and waste rock disposal facilities overflow ponds remain in the < 0.5-mile wide migration corridor. NDOW has begun to collect monitoring data to determine specific impacts to migrating mule deer in this area. One radio-collared mule deer doe migrated through the area in 2006. (Wilkinson 2007b).

Effects of wildfires to terrestrial wildlife species include loss of habitat (forage and cover) which can lead to die-offs of mule deer and pronghorn antelope as well as other species. Some native shrub communities have been replaced by cheatgrass-dominated grasslands.

Numbers of migrating mule deer are not well known because the herd has declined from 30,000 to about 8,000 animals due to effects of fire on winter ranges and the mild winter of 2006 which caused few mule deer to migrate (Lamp 2007). An emergency antlerless deer hunt was conducted in Area 6 during the 2006 hunting season. The purpose of this hunt was to reduce the deer population in response to the loss of crucial habitat destroyed by fires during the summer of 2006. A total of 1,116 permits were issued for this hunt and hunters harvested 646 animals.

Displacement of mule deer and pronghorn from wildfire, mining activities, and other land uses increases demands on adjacent habitats. Most habitats are at carrying capacities and can not support additional animals (Wilkinson 2007a). Displaced animals would be lost from the population until habitats are rehabilitated, restored, or mitigated, allowing population to expand into affected areas.

Pronghorn habitat in wildlife management Unit 067, 068, Western Elko and Northern Lander and Eureka counties, experienced range fires of over 500,000 acres during the summer of 2006 (NDOW 2007a). The Area 6 antelope herd was approximately 1,200 animals, but following the 2006 summer wildfires, NDOW (2007b) estimates that Area 6 can support 700 to 800 antelope.

Elk

Extensive fires in the Study Area have converted many shrub-dominated communities to grass-dominated communities. Elk, being primarily grazers, have benefited from increased grass production following fires; however, a multiple shrub component is needed for cover and forage diversity on a yearlong basis. Reclaimed areas on mine sites provide forage for elk because reclamation seed mixes have a large grass component, especially in early stages of reclamation. Mine perimeter fences may preclude use by elk until they are removed (Wilkinson 2007b).

Special Status Species

Fires have negatively impacted sagebrush-associated species' habitat in the short- to mid-term (5 to 15 years), due to loss of sagebrush canopy cover and vertical structure for nesting and cover. Diversity of forb and grass communities on cheatgrass dominated areas remains limited which also negatively impacts sagebrush obligates and associated species. Conversion of extensive areas of shrub steppe in the Study Area by fire to large expanses of burned area, dominated by exotic grass species, has reduced the prey base and nesting habitat

for numerous sagebrush associated species. The *Wildfires and Reseeding* section of Chapter 2 provides a description of areas burned and reseeded in the Study Area. Seeding projects have reestablished forage for certain species; however, in some cases, reseeded areas have burned in later years after vegetation had become established.

Yellow-Billed Cuckoo (Candidate for Federal Listing)

Mine dewatering could potentially reduce available water and cause long-term effects to the riparian community within the Study Area, which could result in the loss of breeding, foraging, and cover habitats for the yellow-billed cuckoo. To date, losses of riparian habitat due to mine dewatering have been minor, associated with reduced flows in several springs. Overall, improvement of riparian habitat in the Maggie Creek and Willow Creek drainages associated with enhancement projects have resulted in a net increase in riparian habitat quality, which could potentially benefit the yellow-billed cuckoo.

Bald Eagle (Delisted)

Discharges of mine water to Maggie Creek and the Humboldt River would tend to slow the rate at which the Humboldt River becomes ice covered. Because ice-free water provides habitat for the primary prey of bald eagles (waterfowl and fish), mine water discharges could benefit wintering eagles.

During winter in the Study Area, bald eagles typically forage on black-tailed jackrabbits and carrion and can be found far away from open water sources. Impacts to the forage species would impact bald eagle wintering in the Study Area (Lamp 2007).

Sage Grouse (BLM Sensitive Species)

The primary factor affecting sage grouse habitat in the Study Area is wildfire (**Table 3-10**). Impacts on sage brush habitat from fire (48% loss of sagebrush habitat subject to temporary to long-term reduction in shrub cover), mining (4% loss of sagebrush habitat), and other disturbances have reduced habitat for sage grouse by more than 50 percent in the Study Area (**Figures 2-4** and **3-4**). Habitat has been affected on a temporary to long-term basis by wildfires dependent, in part, on time of natural recovery of vegetation including sagebrush, and success of post-fire habitat rehabilitation including shrub, grass, and forb seeding. Livestock grazing is a factor that affects sage grouse habitat. Trampling of springs and wet meadows, by livestock reduces the quality and quantity of water and vegetation. The 2006 fires affected habitat for an estimated 10,000 sage grouse and approximately 117 sage grouse leks on the Elko District. Additional leks were affected by fires between 1999 and 2005 and fires as of July 2007 (Wilkinson 2007b). NDOW is in the process of determining the status of fire-affected and non-affected leks in Northeastern Nevada. In the Study Area, fires have burned 571,797 acres of sage grouse habitat (**Table 3-10**).

Mining, construction of roads, power lines, fences, and reservoirs have resulted in loss and fragmentation of sage grouse habitat. Mining companies, BLM, and NDOW have implemented programs to mitigate direct impacts to sage grouse populations and habitat due to mining activities, as well as provide off-site mitigation measures to address permanent impacts to sage grouse and associated sagebrush habitats affected by mining activities. Re-seeding of burned areas to establish sagebrush-grassland communities has been widespread in the Study Area (see *Wildfires and Reseeding* in Chapter 2). From 1999 through 2006, approximately 287,000 acres of

previously burned sage grouse habitat was reseeded; however, the success of re-establishment of sagebrush and other plants important to sage grouse, on re-seeded areas, has not been comprehensively studied.

Potential loss of springs and seeps due to mine dewatering activities has the potential to reduce amounts of riparian habitat and water sources for sage grouse. Springs and riparian areas are important for brood rearing because of drinking water, increased insect numbers, and succulent green vegetation, which are important summer sage grouse foods. To date, few springs or seeps have been affected by mine dewatering activities. Mine operators in the Carlin Trend monitor springs and seeps throughout the Study Area. Conditions of these water sources are described in the *Water Quantity and Quality* section of this chapter. Mitigation programs implemented by mining operations include obligations to maintain or augment flow in springs that are import to wildlife species.

Pygmy Rabbit (Sensitive Species)

Currently, in the Study Area, there are about 1.2 million acres of sagebrush habitat, but not all of this would provide suitable habitat for pygmy rabbits. As discussed for sage grouse, loss of sage brush habitat from fire (48% loss of sagebrush habitat), mining (4% loss of sagebrush habitat), and other disturbances have reduced habitat for pygmy rabbits by approximately 50 percent in the Study Area (**Figure 3-4**).

Preble's Shrew (Sensitive Species)

Preble's shrews occupy a diversity of habitats including wetland and marshy habitats with emergent vegetation and woody species. Mine dewatering could cause springs to dry or become smaller, which could reduce potential habitat for Preble's shrew. Widespread wildfires have altered and would continue to alter habitat for this species.

Swainson's Hawk

Swainson's hawks are seasonal residents and nesters in the Study Area, migrating to South and Central America in winter (Ryser 1985). This hawk nests in clumps of trees, often in agricultural and riparian areas or near springs. Swainson's hawks feed mostly on large insects and small mammals; however, they will also take bats, birds, and amphibians. If springs dry and associated vegetation is lost, potential nesting habitat could be reduced.

Ferruginous Hawk

Ferruginous hawks nest in scattered juniper trees at the interface of the piñon-juniper zone and desert shrub communities overlooking broad open valleys (Herron *et al.* 1985). The ferruginous hawk preys mostly on rodents and rabbits but will also take birds and reptiles. Because ferruginous hawks often nest in low trees and shrubs, wild fires have probably reduced nesting habitat.

Ferruginous hawks concentrate in the wet meadows along upper Maggie Creek during summer and early fall. This area appears to be a staging area where the birds feed on large populations of small mammals prior to migration (BLM 2002a). Groundwater drawdown from mining activities could reduce amounts of water that support riparian vegetation and wet meadows in the upper Maggie Creek drainage, and reduce habitat quality for small mammals – prey of ferruginous hawks staging to migrate.

White-faced Ibis (Sensitive Species)

The white-faced ibis is a shorebird that nests in heavy emergent wetland vegetation. Wet meadows (950 acres) along Maggie, Coyote, and Little Jack creeks are potential nesting and foraging areas for this species. Groundwater drawdown from mining activities could reduce

amounts of water that support riparian vegetation and wet meadows in the upper Maggie, Coyote, and Little Jack drainages and reduce habitat quality for nesting and foraging.

Black Tern (Sensitive Species)

Black terns typically nest in marshes and small ponds often on old muskrat houses, floating mats of vegetation, or abandoned coot or grebe nests (Montana Natural Heritage Program 2007; Cornell Laboratory of Ornithology 2001). Water levels in most black tern breeding habitats are from 0.5 meters to 1.0 meter deep. Black tern habitat most likely occurs in the upper Maggie Creek drainage of the Study Area.

Impacts to existing or potential black tern nesting habitat could occur if groundwater drawdown from mine dewatering dries marshes or ponds or reduces recharge to breeding habitat associated with springs and stream flow.

Northern Goshawk (Sensitive Species)

Goshawks in the Study Area occupy shrub steppe habitat and usually nest within 100 yards of a spring or stream (BLM 2002a). Wide-spread wildfires may have affected foraging habitat for goshawk by converting shrub steppe habitats to grasslands dominated by annual grasses. The loss of shrub cover and density has probably reduced the prey base for many species associated with shrub habitats. If mine dewatering causes flow to decrease or stop in springs and seeps, potential nest sites could be affected.

Burrowing Owl (Sensitive Species)

The burrowing owl generally nests in abandoned rodent burrows in areas with low or desert vegetation. Widespread wildfires have altered diversity and structure of natural vegetation and converted many areas to stands of annual grass with few shrubs. Prey for burrowing owls (small mammals and insects) likely has been reduced by conversion of native communities to large expanses of burned area, dominated by exotic grass species.

The spadefoot toad is an important part of the burrowing owl's diet in parts of Nevada. If flows to springs and seeps decreases or stops as a result of mine dewatering potential breeding habitat for the spadefoot toad could be affected.

Loggerhead Shrike (Sensitive Species)

This species typically occupies open habitats where it perches on shrubs, trees, and other elevated structures. The shrike preys on small birds, insects, lizards, and small mammals. Conversion of extensive areas of shrub steppe in the Study Area by wildfire to large expanses of burned area, dominated by exotic grass species, has probably reduced the prey base and nesting habitat for this species.

Bats (Sensitive Species)

Wetlands and surface water associated with springs and seeps, sagebrush grasslands, juniper woodlands, and rocky outcrops in the Study Area provide habitat for sensitive bat species. Rock crevices may provide roosting habitat and marginal breeding habitat. Caves, abandoned mines, and abandoned buildings provide optimum habitat for roosting and breeding for colonies of bats. Water sources are critical to bats because they drink from open water and insects are more abundant around wetlands and open water. Studies in desert habitats have found that bat activity is 40 times greater near wetlands and riparian areas than in upland areas (Nevada Bat Working Group 2002). Even high-elevation tree-roosting bats fly to open water, wetlands, and riparian areas to drink and forage. Mine dewatering that reduces or eliminates flows from springs and seeps would adversely affect foraging habitat for bats. Based on the CIA report (BLM 2000), 182 springs potentially could be dewatered in the Study Area from mining activities.

Pit lakes are predicted to establish after mining is completed in the Gold Quarry, Betze/Post, and Tara pits. Water in these future pit lakes is predicted to contain varying concentrations of constituents that would be released from the exposed rocks in the pit walls (see *Water Quantity and Quality* section of this chapter). Pit lake water quality would be unique to each pit as the factors that influence water quality are unique to each pit including but not limited to pit depth, water table elevation, inflow rate, period of time to fill to premining water table levels, oxygen content, pit shape, stratification of the water column, and geology.

Bats, water fowl, and other wildlife may be attracted to the pit lakes as a source of water and for prey. Given the range of pit water quality conditions that could occur comparing one pit to another and within pits over time, the potential effect of pit lake water quality on wildlife species would also vary (see *Water Quantity and Quality* section in this Chapter).

Nevada Viceroy (Sensitive Species)

This butterfly occurs in moist areas that provide habitat for willow and cottonwood, host species for the larvae. Loss of riparian habitat or springs and seeps, as a result of mine dewatering, would reduce potential habitat for this species.

Federally listed species or special-status species have not been identified in the TS Power Plant project area; therefore, no impacts are anticipated (ENSR 2004b). Sensitive species that may occur in the area include the pygmy rabbit, bat species, Swainson's hawk, ferruginous hawk, loggerhead shrike, long-billed curlew, western burrowing owl, Nevada viceroy, and the Columbia spotted frog.

Wildfires have affected foraging habitat for sensitive species by converting some shrub steppe habitats to grasslands dominated by annual grasses. Temporary, to long-term or more permanent loss of shrub cover and density has reduced prey base for many species associated with shrub habitats. Wildfires have altered diversity and structure of natural vegetation and converted many areas to stands of annual grass with few shrubs. Prey (small mammals and insects) for some species has likely been reduced by conversion of native communities to large expanses of burned area, dominated by exotic grass species.

If springs, seeps, or stream reaches become dry in response to mine dewatering activities, and associated vegetation is lost, potential nesting and foraging habitat would be reduced (see *Water Quantity and Quality* section in this chapter). To date, few springs have exhibited change in flow as a result of mine dewatering activities (see *Water Quantity and Quality* section in this chapter). Springs that have formed (Sand Dune, Knob, and Green) in Boulder Valley as a result of discharge of excess water from mine development have created additional riparian habitat that could benefit hawk and owl species due to increase in prey base supported by these springs.

Mine dewatering could potentially reduce available water and cause long-term effects to the riparian community within the Study Area, which could result in loss of breeding, foraging, and cover habitats; increased animal mortalities; reduction in overall biological diversity; possible genetic isolation; and possible long-term impacts to population numbers of some species. Recovery of groundwater and surface water would be gradual. Incremental habitat loss would affect big game, upland game birds, waterfowl, shorebirds, raptors, songbirds, non-game mammals (e.g. bats), area reptiles, and amphibians. Implementation of programs to rehabilitate and stabilize riparian and wetland areas (see *Stabilization and Rehabilitation Programs* section in Chapter 2) has increased the size, function, and health of these areas.

Oil, Gas, and Geothermal

Potential development of fluid minerals (oil, gas, and geothermal) would result in creation of roads and land disturbance in areas where these surface activities do not currently exist. Introduction of human activity in remote areas would cause displacement of animals in response to road use. Plans for oil and gas development have not been submitted to the BLM as of the date of this document. TG Power LLC proposes to construct a geothermal power plant near the Spanish Ranch north of Tuscarora. An associated 120kV power line is proposed from this power plant to the Humboldt Substation north of Elko and will cross both public and private land.

Energy Development and Distribution

Construction and operation of the TS Power plant would result in displacement of big game species from the project area. Potential impacts to mule deer would be minor since the majority of the southern Boulder Valley is designated as limited range for mule deer (habitat occasionally inhabited and/or contains a small population of scattered animals). Pronghorn occur throughout the valley, but are most common near the irrigated fields in northern and central Boulder Valley (ENSR 2004b). The area is not important habitat for mule deer, pronghorn antelope, or elk; but these species, which may transient in the area, will be excluded from the power plant site by a security fence around the perimeter.

No federally listed species or special-status species have been identified in the TS Power Plant project area; therefore, no impacts are anticipated (ENSR 2004b). Sensitive species that may occur in the area include the pygmy rabbit, bat species, Swainson's hawk, ferruginous hawk, loggerhead shrike, long-billed curlew, western burrowing owl, the Nevada viceroy, and the Columbia spotted frog (ENSR 2004b).

Vegetation in the area of the TS Power Plant is greasewood dominated and does not have high habitat value for big game species or sage grouse. The project will remove a relatively small amount of habitat, primarily used by nesting birds and small animals.

Clearing, construction, and on-going maintenance of the transmission power line rights-of-way have resulted in habitat loss, habitat degradation, and displacement of wildlife. Temporary loss of sagebrush-grassland would contribute to cumulative effects on mule deer, pronghorn, pygmy rabbits, raptors, sage grouse, songbirds, and small mammals. Natural revegetation and/or reclamation of disturbances within the new transmission corridor would change the species composition and densities of some wildlife species.

Water quality of the power plant cooling ponds is not expected to be hazardous to waterfowl or other wildlife. Power plant cooling ponds will be fenced with a design specified by NDOW for artificial industrial ponds to prevent access by terrestrial wildlife. Additional measures (e.g., water balls, netting and hazing) may be required to prevent access by birds (ENSR 2004b).

Noise

Some noises generated by mining and exploration activity are sporadic, impulsive, and fluctuate in intensity and duration (e.g., blasting, drilling, rock dumping) (Bowles 1995). Wild animals tend to move away from disturbances which cause these sporadic noises. Other noises are constant (24 hours/day; 7 days/week; 300 + days/year) such as mill operations and sprinkler operations. Animals tend to habituate to noises where there is repeated exposure and they adapt behaviorally and physiologically (Bowles 1995).

Sage-grouse numbers on leks within one mile of a coal bed methane compressor station in

Campbell County, Wyoming, were consistently lower than on leks not affected by this disturbance. Lek activity by sage-grouse decreased downwind of drilling activities, suggesting that noise had measurable negative impacts on sage-grouse (Braun 2006). One sage grouse lek is located within one mile of the Pete Mine in the Study Area.

Urbanization

Land development in the Study Area including subdivision and commercial properties, are described in the *Land Development* section of Chapter 2. Current development has, and will likely continue to, affect mule deer and antelope habitat in the vicinity of the town of Carlin (Wilkinson 2007b).

Fences

Fences have been constructed in the Study Area to enclose mine development, preclude grazing on burned areas, and as a result of other land development activities such as subdivisions, commercial/industrial facilities, and public rights-of-way. Fences can impede wildlife migrations especially during winter and early spring when deer are in a weakened condition. New fences on BLM land and at mine sites are constructed to facilitate wildlife movement and implement standard operating procedures to minimize conflicts to wildlife. Modifications of existing fences by BLM and NDOW to facilitate movement of big game are ongoing in the Study Area.

Non-native, Invasive Weeds

Cumulative effects on wildlife from invasive, non-native species include displacement of riparian/wetland habitat and native vegetation vital to wildlife. Further discussion of infestations and treatment programs on-going in the Study Area is contained in the *Vegetation Resources* section of this chapter.

Livestock Grazing

Grazing practices in the Study Area have improved over the past 20 years, notably within the Dunphy Hills area and the Izzenhood Range (NDOW 2007a); however, grazing in some locations continues to have a negative impact on winter habitat and intermediate range, particularly on kochia and bitterbrush (NDOW 2007a). Continuation of reasonably foreseeable livestock grazing in the Study Area will affect wildlife and wildlife habitat with the extent of impact depending on intensity and duration of grazing on public and private land. Ongoing efforts to properly manage livestock grazing in the Study Area have demonstrated that livestock grazing and healthy riparian areas are compatible. For example, stream and riparian area restoration projects including the Maggie Creek Watershed Restoration Program, Upper Willow Creek Restoration Program, and projects on the TS Ranch have resulted in improvement and expansion of riparian and wetland habitat in the Study Area.

RIPARIAN AREAS AND WETLANDS

This Draft SEIS provides new quantitative data collected between 2002 and 2007 to further characterize cumulative effects to riparian areas and wetland resources previously described in SOAP EIS (BLM 1993) and SOAPA EIS (BLM 2002a).

Thirteen vegetation types were previously identified along tributaries to the Humboldt River within the Study Area (BLM 2002a). A total of 4,530 acres of riparian/wetland habitat occur within the Study Area; including 2,218 acres in Maggie Creek, 1,685 acres in Rock Creek (including Boulder Flat), 228 acres in Susie Creek, 388 acres in Humboldt River watersheds, and 10 acres associated with small tributaries to the Humboldt River. Approximately 193 acres of riparian habitat have been added in the Maggie Creek Basin as a

result of restoration activities (Open Range Consulting 2007).

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for riparian and wetland resources is located in the Humboldt River basin encompassing the following hydrographic areas: Susie Creek, Maggie Creek, Marys Creek, Boulder Flat, Rock Creek Valley, Willow Creek Valley, and the adjoining portion of the Humboldt River (**Figure 3-7**). The Study Area encompasses riparian and wetland areas that could be affected by groundwater drawdown associated with mine pit dewatering.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Newmont Spring Monitoring

In the fall of 1990, 182 springs were identified in the Study Area that could be affected by mine dewatering (BLM 2000). Currently, 33 of these seeps and springs are monitored (Newmont 2007d, 2007h). Most of these springs were monitored biannually (fall and spring) between 1990 and 2002. The Record of Decision for SOAPA (BLM 2002a) changed the monitoring to fall only and removed many of the springs because of negligible flow in the fall. Spring monitoring was eliminated because flow was denominated by snow melt and rain. Monitoring results are provided to BLM in annual seep and spring reports (Newmont 2007d, 2007h).

Review of flow data indicates no measurable change in flow rates for 28 of the 33 springs. Four springs have exhibited variation in flow, reduction in flow, or have gone dry for one or more years. Groundwater monitoring has not indicated any drawdown from mine dewatering operations in the direction of these springs. Hydrologic investigations have identified grazing, evolving streambed morphology, and anthropogenic flow controls as the primary factors influencing flow measurements at these springs. One spring exhibited an increase in flow since 2001 due to relocation of its monitoring point in accordance with the Maggie Creek Basin Monitoring Plan (Newmont 2007d).

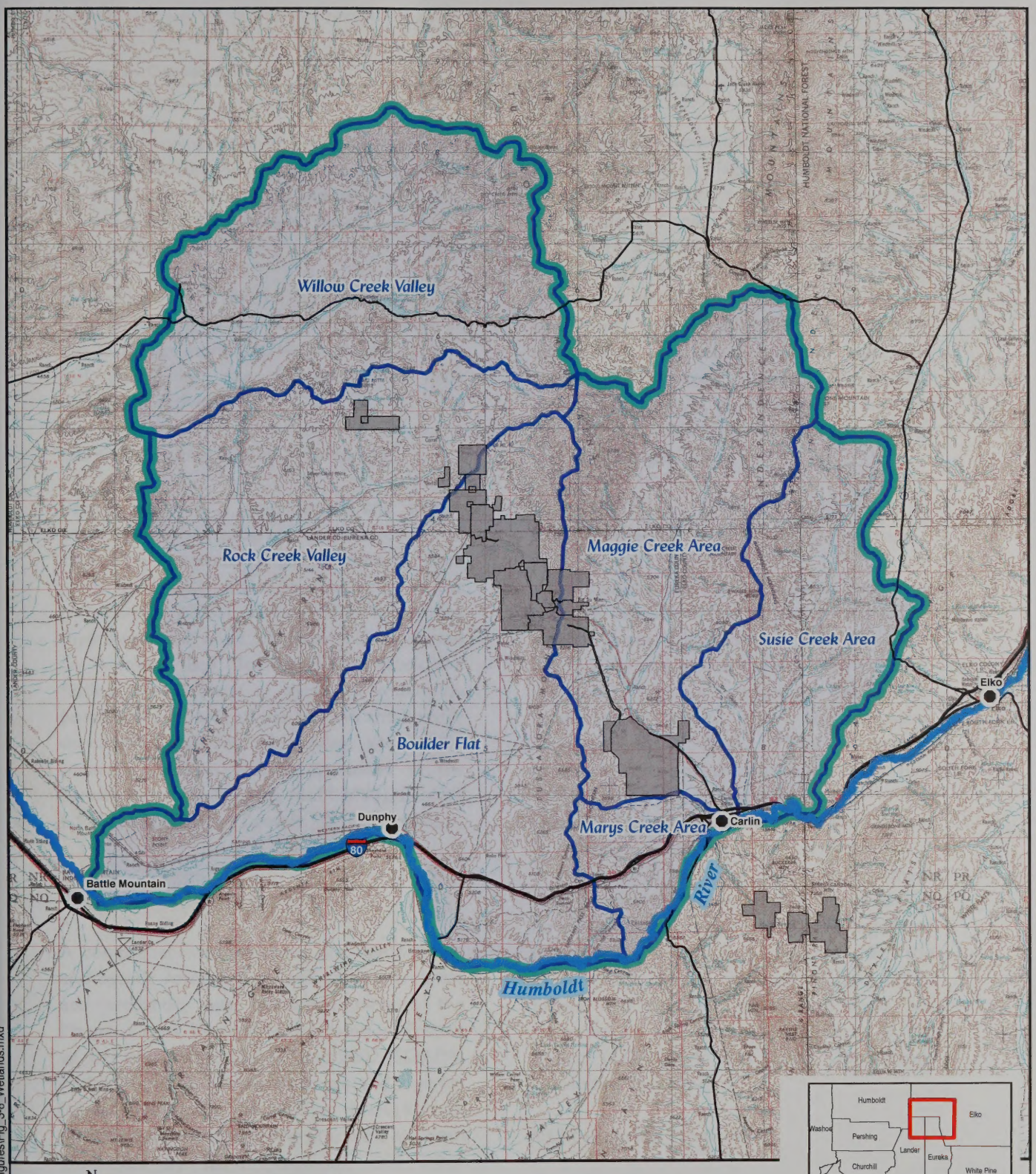
Maggie Creek Basin Monitoring Plan and Leeville Hydrologic Monitoring Plan

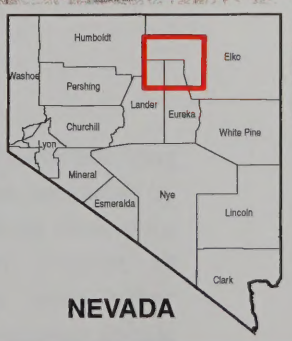
Newmont conducts groundwater and surface water monitoring related to dewatering operations at its SOAPA and Leeville operations on a monthly basis. Data are reported on a semi-annual basis. The purpose is to evaluate impacts of dewatering at SOAPA and Leeville on the hydrological environment, which could have a potential impact on riparian/wetland resources. Monitoring since 2002 generally confirms the hydrologic analysis contained within the SOAPA EIS (BLM 2002a) and Leeville EIS (BLM 2002b) documents.

Barrick Spring Monitoring

Barrick's mitigation plan includes monitoring a number of springs, seeps and stream reaches within the Study Area (AATA 2006). Under an agreement with BLM, Barrick conducts a continuing seep and spring monitoring program that commenced in 1989. The study consists of evaluating water chemistry and measuring flow rates, as well as collecting vegetation data at designated sites. Fourth quarter 2005 monitoring indicated the following (AATA 2006):

- Base flow appears to have been maintained by a rather consistent "older" groundwater source; and





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Legend

- Cities
- Humboldt River
- Interstate Highway
- Other Major Roads
- Plan Boundaries
- Hydrographic Sub-basins
- Cumulative Effects Study Area

U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

RIPARIAN AREAS AND WETLANDS
CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-7

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- Species composition and general vegetation status remain comparable to that observed in previous years. Seeps and springs continue to be dominated by wetland species.

Monitoring results for the fall 2005 Betze/Post Seep and Spring Study indicated only three of the 23 springs monitored within the Study Area had gone dry due to Betze/Post mine dewatering activities.

Barrick Boulder Valley Monitoring

Barrick conducts a groundwater and surface water monitoring program that addresses "all aspects of potential impacts resulting from pumping of water including dewatering of the pit" (Barrick 2006a). Surface water monitoring (hydrologic and water chemistry) is conducted on Antelope, Bell, Boulder, Brush, Rock and Rodeo creeks. Some of these fall within the possible impact area of the SOAPA and Leeville dewatering activities. Monitoring since 2002 generally confirms analysis contained in the Barrick Betze Project SEIS (BLM 2003), SOAPA EIS (BLM 2002a), and Leeville EIS (BLM 2002b).

Maggie Creek Watershed Restoration Project Monitoring Program

A comprehensive monitoring plan for fisheries and aquatic resources, as well as riparian areas and wetlands, was developed through the Maggie Creek Watershed Restoration Project as part of the 1993 (SOAP) and 2002 (SOAPA) mitigation plans. Detailed stream and riparian habitat monitoring, as well as evaluation of prescriptive livestock grazing practices, has been conducted by BLM, Newmont, and other partners at regular intervals since 1994.

Studies by Open Range Consulting (2007) show an increase of 193 acres in wetland riparian acres and an increase of 1.8 miles stream length (due to increase in stream sinuosity) along Maggie Creek between 1994 and 2006. Sediment loading in Maggie Creek has reduced from more than 8,000 tons/day of sediment (as total suspended solids - TSS) during high flows in 1993 to a sediment load of less than 1,000 tons/day (as TSS) during similar flow in 2005 (Newmont 2007d). Quality of habitat for fish and many species of wildlife result from increases in the woody riparian vegetation overhanging the water column, improved pool quality, and depth at the shore-water interface (i.e., Coyote, Little Jack, and Maggie creeks) (Trout Unlimited 2007a).

Barrick Upper Willow Creek Habitat Enhancement Plan Monitoring Program

A monitoring plan for riparian areas and wetlands was developed as part of the Upper Willow Creek Habitat Enhancement Plan (BLM 2003). BLM and private consultants have been monitoring riparian conditions and water temperatures since 2001 at designated locations. In addition, Trout Unlimited, monitors fish populations in streams (see *Fisheries and Aquatic Resources* section in this chapter). Upland habitat monitoring at several designated locations has also been on-going.

The Upper Willow Creek Habitat Enhancement Plan has resulted in watershed improvements for numerous terrestrial and aquatic organisms in riparian and steam habitats in the Willow/Rock Creek drainage (CCA 2004). Extent and condition of riparian areas has increased or improved since initiation of the project (CCA 2004; BLM 2006b; Open Range Consulting, Inc. 2007).

BLM Riparian Monitoring

Functioning condition surveys of lentic (standing water) riparian habitats have been completed by BLM on allotments within the Study Area since 2003 (**Table 3-11**). Seventy percent of inventoried seeps and springs were either nonfunctional or found to be functioning at-risk,

with a downward or non-apparent trend. Overuse of riparian vegetation by livestock was identified as the primary cause of poor conditions. Although prescriptive grazing protocols have been employed in portions of the Study Area, many of the lentic functioning condition surveys occurred in allotments or parts of allotments receiving hot season grazing on an annual basis. In some cases (notably Squaw Valley Allotment) recent changes in grazing practices are improving conditions over the allotment as a whole.

BLM has completed monitoring on streams affected by recent wildfires in the Study Area (BLM 2005b, 2006c, BLM 2006d). Healthy riparian areas have either not burned or have recovered rapidly following fire. In wet years such as 2006, high plant moisture content resulted in riparian corridors remaining mostly intact. Some riparian areas were scorched during 2001, but regeneration of burned riparian vegetation has been good. Where riparian habitat conditions were poor prior to the fire, effects have been more long-term and have included channel down-cutting with potential loss of associated wetland plant communities.

CUMULATIVE EFFECTS

Mining operations, industrial development, and agricultural activities in the Study Area are expected to act interactively in affecting regional riparian areas and wetlands where the same water bodies are impacted. Potential cumulative impacts to these resources would include degradation of riparian and wetland habitat from livestock grazing, mining (surface disturbance and dewatering activity), conversion of native riparian/wetland plant communities to communities dominated by invasive non-native species, other industrial development (e.g., power plants and transmission corridors), service roads, wildfire, and in some cases agricultural diversions. Riparian/wetland vegetation could be lost, either on a temporary or permanent basis. Currently, potential for impacts to riparian/wetland resources are associated with establishment of invasive non-native species (weeds) and with annual hot season grazing by livestock (where it occurs) resulting in loss of habitat and decrease/loss of vegetation.

With the exception of some localized impacts (reduced flow in Maggie Creek narrows and drying of a few springs), dewatering impacts to approximately 618 acres of riparian and wetland habitats identified in previous EIS documents have not materialized. Improvement and expansion of riparian/wetland habitat has occurred in response to the Maggie Creek Watershed Restoration Project and Upper Willow Creek Habitat Enhancement Plan (Evans 2007).

Infiltration of excess mine water from dewatering operations has resulted in an increase in water levels, or mounding, south of Maggie Creek Reservoir (BLM 2002a), lower Maggie Creek, and upper Boulder Valley (BLM 2000). Mounding in the Maggie Creek area is likely due to seepage from the Maggie Creek Reservoir; reduced pumping from the Carlin Formation near SOAPA; and recharge along Maggie Creek as a result of mine dewatering discharge and irrigation.

In 1992-1993, seepage from the TS Ranch Reservoir resulted in the formation of three new springs (Sand Dune, Knob and Green Springs) in the northeastern portion of Boulder Flat approximately 5 miles south the of the TS Ranch Reservoir (BLM 2000). Extensive stands of riparian and wetlands vegetation has developed with formation of these springs, resulting in approximately 1,200 acres of habitat. The combined flow from these springs is about 6,000 gallons per minute (Listerud 2007). This flow and associated riparian and wetlands habitats will continue as long as water

TABLE 3-11
Summary of Functioning Condition Surveys for Lentic Riparian Areas

Allotment[1]	Total No. Sites Evaluated	Rating (No. Sites)[2]				
		PFC	FARU	FARN	FARD	NF
2005						
Blue Basin	37	8	1	4	19	5
Carlin Field	2	2	-	-	-	-
Hadley	3	1	-	-	2	-
Lone Mountain	19	6	3	2	6	2
T Lazy S	25	8	3	1	8	5
Twenty-five	40	11	2	3	16	8
2004						
Squaw Valley	58	1	11	0	37	9
2003						
Tuscarora	45	7	4	6	7	21
Totals (%)	**229**	**44 (19)**	**24 (10)**	**16 (7)**	**95 (41)**	**50 (22)**

[1]Allotments within the Study Area for Wetlands and Riparian Areas.
[2]Ratings: PFC=Proper Functioning Condition; FARU=Functional-at-Risk, Upward Trend; FARN=Functional-at-Risk, Trend Not Apparent; FARD=Functional-at-Risk, Trend Downward; NF=NonFunctional.
Source: Prichard *et al.* 1999, 2003.

from mine dewatering is placed in the subsurface near the TS Reservoir. Eventually, these springs will disappear once discharge to the TS Ranch Reservoir is discontinued. Cessation of flow would result in a loss of the established riparian and wetland vegetation, as well as associated aquatic organisms. The spring areas would revert to pre-discharge conditions and would again support upland vegetation species.

Potential impacts to riparian vegetation and aquatic habitats along the Humboldt River from base-flow reductions following cessation of pumping are less than projected in SOAPA (BLM 2002a) and CIA (BLM 2000). See *Water Quality and Quantity* section in this chapter.

Recent fires have affected some riparian and wetland habitats in the Study Area, many of these areas did not burn or have shown recovery in years following fires. Condition of riparian areas prior to wildfire represents the single most important influence in predicting effects of fire (Evans 2007). Many stream and riparian habitats burned by recent wildfires in the Study Area that are being managed under prescriptive livestock grazing programs continue to improve.

Potential effects of future wildfire on riparian areas and wetlands are dependent on site conditions at the time of a fire. Wetland and riparian areas that have retained sufficient moisture would likely survive wildfire with minimal loss of vegetation and aquatic life. Sites that enter the fire season in a dry state or are in poor ecological condition are more likely to be damaged by fire.

Previous predictions of higher loading of sediment due to mining activities, which could adversely affect wetlands in the Humboldt River, Humboldt Sink, and Wildlife Management Area 6 have not been documented. Sediment loading in Maggie Creek has been shown to be reduced during high flows in response to

development of a healthy and well established riparian zone (see discussion of Maggie Creek Watershed Restoration Project in this section).

Quality of mine discharges is in compliance with permit limits, with no documented adverse impacts on receiving water including the Humboldt River (see *Water Quantity and Quality* section in this chapter). This supports the prediction that current and reasonably foreseeable mine discharges would not impact water quality and associated riparian/wetland resources in the Humboldt River.

Flooding in 2005 and 2006 throughout the Study Area resulted in erosion of some streams. Flooding impacts appeared to be moderated along portions of the Maggie Creek and Willow Creek drainages as a result of habitat restoration and re-vegetation efforts of the Maggie Creek Watershed Restoration Project and Upper Willow Creek Habitat Enhancement Plan (Evans 2007)

Grazing has affected and will continue to affect riparian areas to varying degrees. Depending on the level of management, livestock grazing may have minimal to extensive impacts on riparian management. Over the last several decades, riparian areas have generally improved throughout portions of the Study Area. As the need and opportunity for management changes are identified and implemented, riparian areas are expected to continue to improve. All allotments within the Study Area are scheduled for 10-year grazing permit renewals which include environmental analysis of impacts to riparian areas from livestock grazing.

The TS Power Plant, located in the lower Boulder Valley, will not have any discharges to area streams, including the nearby Humboldt River. In addition, no wetlands or riparian areas are located in the project area. No impacts to riparian/wetland vegetation are expected and, therefore, the power plant project would not contribute impacts to riparian and wetlands in the Study Area.

FISHERIES AND AQUATIC RESOURCES (INCLUDING THREATENED, ENDANGERED, AND CANDIDATE SPECIES)

This Draft SEIS provides new quantitative data collected between 2002 and 2007 to further characterize cumulative effects to fisheries and aquatic resources previously described in the SOAP EIS (BLM 1993) and SOAPA EIS (BLM 2002a).

Fish species found in streams in the Study Area include Lahontan speckled dace, Lahontan redside shiner, Tahoe and mountain suckers, and Lahontan cutthroat trout (BLM 2000). In 2006 and 2007, smallmouth bass were documented in Lower Maggie Creek (MFG, Inc. 2006; Evans 2007). According to BLM Elko Field Office stream survey files, the lower reaches of Rock Creek support non-native warm water fish species and bullfrogs (Evans 2007). With the exception of the Lahontan cutthroat trout, no other trout species (including non-natives) have been found within the Maggie Creek sub-basin (Elliott 2004). Brook trout were found in Spring Creek in 1992, but none were found during a 1997 survey of the stream (BLM 2002a). Brook and rainbow trout were previously stocked in Willow Creek, Rock Creek, Nelson Creek, and Willow Creek Reservoir; but none had been found in recent surveys as reported in 2004 (Elliott 2004).

The Humboldt River is considered a warm water fishery with species tolerant of high sediment load and warm water temperatures. Twenty-three species, including many which are introduced, have been recorded for the Humboldt River. In addition to common native minnow and sucker species found in headwater streams, the Humboldt River also supports the Lahontan tui chub (BLM 2003).

In 2006, a population of bullfrogs was identified in the lower reaches of Susie Creek (Evans 2007), although none were known to occur in this stream prior to then. A single bullfrog was also reported about 10 to 15 miles upstream of this location (Warren 2006).

Currently there are four species that are federally threatened, candidate or BLM-sensitive (fish, amphibians, and invertebrates) that reportedly occur within the Study Area:

- Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) - federally listed (threatened) species;
- California floater (*Anodonta californiensis*) – BLM-sensitive species;
- Columbia spotted frog (*Rana luteiventris*) – federal-candidate species; and
- Springsnails (*Pyrgulopsis sp.*) – some species are BLM-sensitive; others have importance because of limited occurrence and/or potential for future listing.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for fisheries and aquatic resources encompasses a portion of the Humboldt River basin including the following hydrographic areas: Susie Creek, Maggie Creek, Marys Creek, Boulder Flat, Rock Creek Valley, Willow Creek Valley, and the adjoining portion of the Humboldt River (**Figure 3-7**). This Study Area encompasses riparian areas and wetlands, as well as streams that could be affected by groundwater drawdown associated with mine pit dewatering.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Information collected as part of the following programs and projects is relevant to fisheries and aquatic resources and is summarized in the *Riparian Areas and Wetlands* section of this chapter:

- Newmont Spring Monitoring;
- Maggie Creek Basin Monitoring Plan;
- Barrick Spring Monitoring;
- Barrick Boulder Valley Monitoring;
- Maggie Creek Watershed Restoration Project (including Monitoring Program); and
- Barrick Upper Willow Creek Habitat Enhancement Plan (including Monitoring Program).

Additional programs, studies and monitoring efforts provide current information specific to fisheries and aquatic resources within the Study Area. These sources of information are summarized below.

Trout Unlimited's Strategies for Restoring Native Trout Program – Maggie and Willow Rock Creek Drainages

A description of Trout Unlimited's Strategies for Restoring Native Trout Program is contained in the *Stabilization and Rehabilitation Programs* section of Chapter 2. Results of Lahontan cutthroat trout monitoring in Maggie Creek watershed have shown fluctuations in Lahontan cutthroat trout populations since 2001, which are likely due to a combination of environmental and treatment influences (Neville and DeGraaf 2006). Poor recruitment in Beaver Creek in 2002 was likely due to a large fire in 2001 that affected riparian habitat allowing increased amounts of sediment to enter the stream. The population rebounded in 2003, but was exposed to a drought in 2004 when the population again declined. An abundance of water in 2005 and 2006 likely provided

sufficient flow that Lahontan cutthroat trout were able to pass old culvert "barriers" still in place during spring 2005, allowing them to reach Beaver Creek to spawn. Presence of multiple age classes and higher numbers of Lahontan cutthroat trout in 2006, after culvert replacement in fall 2005, may indicate positive population responses to a combination of the culvert barrier removal and increased water flow. Additional post-barrier removal data are needed to detect a true trend in response to improved connectivity (Neville and DeGraaf 2006).

The Lahontan cutthroat trout population of Coyote Creek showed a decline during the 2004 drought from previously healthy numbers. Population of trout slowly rebounded in 2005 and remained stable in 2006 (Neville and DeGraaf 2006). Higher flows in 2006 caused erosion of upper elevation stream banks during spring runoff, resulting in increased amounts of sediment load in the creek. The increased sediment loading may have had negative impacts on spring spawning and may explain the absence of noticeable increases in Lahontan cutthroat trout numbers despite high water flow. Little Jack Creek may have also had negative effects due to drought conditions in 2003, but improved water conditions in 2005 and 2006 resulted in a higher number of Lahontan cutthroat trout surveyed along with higher pulses of young-of-year.

The Lahontan cutthroat trout population numbers in the Willow/Rock Creek watershed have been steadily increasing as the upper elevation habitat has been improving (Neville and DeGraaf 2006). Multiple classes of Lahontan cutthroat trout were present in 2005 and 2006, suggesting a natural reproducing population exists. Age class structure in the Study Area is mirroring that in the Frazier Creek control site, suggesting that habitat improvements in Willow Creek are affecting recruitment (defined as a measure of the number of fish that enter a class during some time period, such as the spawning class or fishing-size class). Multiple years of data are needed to detect a trend in response to on-going restoration efforts.

Benthic macroinvertebrates were sampled at six survey reaches in 2003 in Willow, Nelson, and Lewis creeks (Neville and DeGraaf 2006). Most reaches were dominated by the *Chironomidae* family (*Diptera* – flies), although one reach was dominated by the *Caenidae* family (*Ephemeroptera* – mayflies). Results of the survey indicated that Willow, Nelson, and Lewis creeks contained water with poor to marginal water quality (based on assessment of taxa richness and abundance of insect orders considered sensitive to pollution). Few taxa collected in upper Willow Creek basin were considered intolerant forms (resistant to pollution), indicating relative poor water quality. Willow, Nelson, and Lewis creeks also had slight to moderate organic enrichment. Currently, no data are available for benthic invertebrates sampled in 2004-2006.

Analyses performed on Lahontan cutthroat trout from Coyote Creek and Little Jack Creek indicated the organisms were pure. Genetic evaluations on four (Frazier Creek, Nelson Creek, Upper Rock Creek, and Toe Jam Creek) of the six Lahontan cutthroat trout recovery populations in the Rock Creek sub-basin indicated that no evidence of hybridization has been found (Elliott 2004). Trout Unlimited contracted with the Conservation Genetics of the University of Nevada-Reno in 2003 to examine population dynamics in the Maggie Creek Basin (Trout Unlimited 2007a). Results of the testing indicated that the Maggie Creek sub-basin (Beaver, Little Jack, and Coyote creeks) currently supports three distinct populations of Lahontan cutthroat trout.

Open Range Consulting - Evaluation of Factors Affecting Lahontan Cutthroat Trout in Three Large Watersheds

A description of this project is contained in the *Stabilization and Rehabilitation Programs* section of Chapter 2. Preliminary results indicate both upland and riparian plant cover has increased between 2003 and 2006 (Open Range Consultants, Inc. 2007). Correspondingly, percent bare ground in the watershed has deceased, while habitat for fisheries and aquatic resources has improved (Evans 2007).

Humboldt River Baseline Studies

As part of its NPDES Permit issued by NDEP, Barrick has conducted monitoring on the Humboldt River from 1995 to 2006. Barrick began discharging to the Humboldt River in late September 1997 and discontinued discharging in February 1999. Monitoring focused on the river's physical characteristics, aquatic habitat, mcaroinvertebrate communities, and to a limited extent, the fish communities in the Study Area (JBR 2007). The data essentially serve as baseline in the event Barrick were to resume discharge to the Humboldt River.

Effects of mine dewatering discharges on Humboldt River biota from the Gold Quarry, Lone Tree, and Betze mines were also evaluated by the USFWS (Wiemeyer *et al.* 2004). Besides serving as a baseline, the study concluded that there is no evidence that mine discharges have had adverse effects on biological resources in the Humboldt River.

BLM Stream Habitat Monitoring

Surveys conducted by BLM between 2000 and 2006 on streams within the Study Area show habitat conditions in response to improved livestock management practices (**Table 3-12**) (Elko Field Office files). With the exception of Marys Creek (which is nonfunctional) and James Creek (which was rated non-functional in 2000), functioning condition studies done in conjunction with stream survey show streams are in proper functioning condition or are functioning-at-risk, with an upward trend (Pritchard *et al.* 1998). Flooding in 2005 and 2006 caused widespread impacts including erosion and deposition; however, streams that were in good condition prior to the flooding were less impacted and are recovering more quickly.

BLM Wildfire Impact Studies

As a result of the fires in 2006, BLM prepared an evaluation of fire impacts to threatened, endangered and candidate species for the Elko Fire Management Plan Amendment issued by the USFWS on December 5, 2003 (BLM 2006d). Information provided in this evaluation addresses monitoring activities and summary of observed impacts.

A number of drainages occupied by the Lahontan cutthroat trout, a federally listed species, and spotted frogs, a candidate species for listing, were burned in 2006 (BLM 2006d). In most cases, uplands were scorched, but riparian zones were green at the time of the fires and remained intact. Approximately 12 miles of occupied Lahontan cutthroat trout habitat and approximately 59 miles (includes some areas outside the Study Area) of potential Lahontan cutthroat trout habitat were affected by the 2006 fire (BLM 2006d). Occupied and streams potentially affected in the Study Area included Susie, Frazer, Trout, Upper Rock, Lone Mountain and Trout creeks. Spotted frogs occur in Susie Creek. Documented loss of Lahontan cutthroat trout, or spotted frogs, as a result or indirect effects of the 2006 fires was not recorded.

TABLE 3- 12
Summary of BLM Stream Surveys in the Study Area between 2000 and 2006.

Stream	Year of Survey	Condition/Trend[1]	Riparian Grazing System
Maggie Creek Subbasin (Maggie Creek Area Hydrographic Basin)			
James Creek	2005	Poor/unknown	No (exclosure on part)
Indian Jack Creek	2005	Poor/up (flood damage)	Yes
Maggie Creek**	2006	Good/up	Yes
Coyote Creek**	2006	Excellent/up (localized flood damage)	Yes
Little Jack Creek**	2006	Excellent/up (localized flood damage)	Yes
Beaver Creek drainage (includes tributaries)**	20000	Excellent/up (areas of flood damage)	Yes
Susie Creek	2003	Good/up	Yes
Rock/Willow Creek Subbasin (Willow Creek Valley Hyrdrographic Basin)			
Frazer Creek **	2003	Excellent/up (localized flood damage)	Yes
Trout Creek	2003	Fair/up	Yes
Toe Jam Creek**	2003	Fair/up	Yes
Upper Willow(*) **	2002	Poor/up	Yes
Lewis Creek(*) **	2002	Good/up	Yes
Nelson Creek(*) **	2002	Good-Excellent/up	Yes
Rock Creek Valley Hydrographic Basin			
Middle Rock Creek	2003	Fair/up	Yes
Lower Rock Creek	2004	Fair/up –flood damage	Yes
Marys Creek Hydrographic Basin			
Marys Creek	2005	Poor – down – severe flood damage	No

[1]Condition rating based on an average of bank cover and bank stability in relation to optimum (optimum is considered totally stable streambank densely vegetated by trees or tall shrubs).
(*) Surveys conducted more recently by Cedar Creek Associates show continued improvement, especially on Upper Willow Creek.
** Lahontan cutthroat trout stream
Note: Spotted frogs in Maggie, Upper Willow, Susie, Coyote, and Little Jack creeks, California floaters in Maggie, Middle and Lower Rock creeks.

The Coyote and Buffalo fires in 2001 and the Esmeralda Fire in 2005 also affected occupied Lahontan cutthroat trout and spotted frog habitat. Both the Frazer and Beaver creek drainages were burned during 2001; while only portions of the riparian zone along Upper Willow Creek burned in 2005. Both Frazer and Beaver creeks were in good condition at the time of the fire and have recovered (BLM 2005b and BLM 2006c).

In addition, Trout Unlimited (2007a) conducted population monitoring on Lahontan cutthroat trout streams affected by recent fires. In areas where habitat conditions have been improving, Lahontan cutthroat trout populations appear to be resilient to effects of catastrophic fires. Lahontan cutthroat trout populations in Frazer and Beaver creeks appear to be increasing, even though both were impacted by fires in 2001. Cutthroat populations in upper Willow Creek appear to be increasing (Evans 2007). No population monitoring for spotted frogs was conducted in 2006.

CUMULATIVE EFFECTS

Mining operations, industrial development, presence of non-native plant and wildlife species, and agricultural activities in the Study

Area are expected to act cumulatively in affecting regional aquatic resources where the same water bodies are impacted. Potential cumulative effects to aquatic resources include degradation of aquatic habitat from livestock grazing, conversion of native riparian/wetland plant communities to communities dominated by invasive non-native weeds, mining (surface disturbance and dewatering activity), other industrial development (e.g., power plants and transmission corridors), service roads, wildfire, and in some cases agricultural diversions. Non-native species including bass and bullfrogs have potential to impact Lahontan cutthroat trout and spotted frogs in the Study Area primarily through predation. Aquatic habitat or species could be lost, either on a temporary or permanent basis. Mitigation programs are expected to reduce these potential impacts.

Land use activities in the Study Area could result in temporary or permanent displacement of some species. One of the major potential impacts to fish and aquatic resources is associated with long-term mine dewatering and drawdown of surface water features, resulting in loss of habitat and decrease/loss of populations. Although the 2006 wildfires were the worst on record for Elko County, no documented loss of Lahontan cutthroat trout or spotted frogs was recorded as a result of the wildfires (BLM 2006d).

Limited surface water impacts resulting from mine dewatering in the Carlin Trend area have been documented in approximately 15 years of monitoring. Groundwater drawdown associated with initial dewatering effort at Betze/Post reduced flow or dried a few springs and changed the flow and vegetation types in Brush Creek, a tributary to Rodeo Creek before 1998. Near SOAPA, a reach in Maggie Creek approximately 3 miles in length (*the Narrows*) now loses water to the carbonate aquifer as a result of water withdrawals associated with mill supply groundwater pumping and dewatering of the Gold Quarry pit (see *Water Quantity and Quality* section in this chapter). Both of these impacts occurred prior to approval of SOAPA and Leeville and are not included in the predicted impacts of those projects. None of the predicted impacts to the 618 acres of wetland/riparian habitats identified in the SOAPA EIS (BLM 2002a) or Leeville EIS (BLM 2002b) documents have occurred (Newmont 2007d).

Newmont's SOAPA and Leeville projects and Barrick's Betze/Post/Meikle Mine complex account for most of the dewatering that has occurred and will continue in the foreseeable future in the Study Area. The combined groundwater cones-of-depression created by dewatering operations could create effects in regional groundwater drawdown, increasing potential for long-term impacts to aquatic organisms and associated habitat. Such impacts would be associated primarily with potential alteration of surface water base-flows and spring flows. Reduced surface water base-flows could eliminate or reduce numbers of fish and many aquatic invertebrates. Extension of the ongoing dewatering discharges would extend the predicted period of reduced base-flows following cessation of mining and thus have the most potential to affect the Humboldt River (see *Water Quantity and Quality* section in this chapter). Mitigation measures implemented by Newmont and Barrick are described later in this section.

Improvement in function and size of wetland/riparian resources in the Study Area as a result of Maggie Creek Watershed Restoration Project, Upper Willow Creek Habitat Enhancement Plan, Susie Creek Riparian Restoration Project, Beaver Creek Riparian Pasture, and improved livestock grazing practices have occurred (see *Stabilization and Rehabilitation Programs* in Chapter 2). The level of recovery documented benefits wildlife including Lahontan cutthroat trout, California floaters, and other aquatic species (Evans 2007).

Infiltration of excess mine water from dewatering operations has resulted in an increase in water levels, or mounding, south of Maggie Creek Reservoir (BLM 2002a), lower Maggie Creek, and upper Boulder Valley (BLM 2000). This mounding in the Maggie Creek area is likely due to seepage from the Maggie Creek Reservoir; reduced pumping from the Carlin Formation near SOAPA; and recharge along Maggie Creek as a result of mine dewatering discharge and irrigation.

In 1992-1993, seepage from the TS Ranch Reservoir resulted in the formation of three new springs (Sand Dune, Knob and Green Springs) in the northeastern portion of Boulder Flat approximately 5 miles south the of the TS Ranch Reservoir (BLM 2000). Extensive stands of riparian and wetland vegetation has developed with formation of these springs is about 6,000 gallons per minute (Listerud 2007). This flow and associated aquatic habitat will continue as long as water from mine dewatering is placed in the subsurface near the TS Reservoir. Eventually, these springs will disappear once discharge to the TS Ranch Reservoir is discontinued. Cessation of flow would result in a loss of the established aquatic habitat and organisms. The spring areas would revert to pre-discharge conditions and would again support upland vegetation species.

Newmont's South Operations Area is the only mining operation discharging to Maggie Creek. Water quality associated with SOAPA and other mine discharges in the Humboldt River basin has been within permit limitations (see *Water Quantity and Quality* section in this chapter). Water quality data collected to date support the prediction that future mine discharges would not impact water quality in the river. Adverse impacts to surface water quality are not expected from mine dewatering at the SOAPA, Leeville, and Betze projects.

Potential impacts to riparian vegetation and aquatic habitats along the Humboldt River from base-flow reductions following cessation of pumping are less than projected in SOAPA (BLM 2002a) and CIA (BLM 2000). See *Water Quality and Quantity* section in this chapter.

Mine dewatering could reduce surface flows due to reductions in spring-fed portions of lower Little Jack/Jack, Beaver and Maggie creeks, which have been documented to support Lahontan cutthroat trout. Most Lahontan cutthroat trout habitat in Little Jack, Coyote and Beaver creeks would not be affected because the upper reaches are not connected to the regional aquifer. Flow reductions have also been predicted for lower Susie Creek (no base-flow between years 2033 and 2078), which is considered a potential recovery area for Lahontan cutthroat trout. No fish have been documented in middle Susie Creek (BLM 2006e).

The Maggie Creek Water Restoration Project has improved stream and riparian habitats in the Maggie Creek drainage since 1993, and further improvement is expected. Potential effects on Lahontan cutthroat trout habitat from dewatering activities are considered unlikely due to a relatively small amount of habitat potentially affected and the demonstrated habitat improvement includes all streams in the Maggie Creek drainage containing Lahontan cutthroat trout habitat except Lone Mountain Creek.

Long-term and cumulative mine dewatering could also adversely affect habitat for the Colombia spotted frog, California floater, and springsnails. Flow reductions in the Maggie Creek sub-basin and lower Rock Creek could decrease habitat used by the California floater. Colombia spotted frogs could also be affected in the Maggie Creek drainage. Springsnails are present in at least five springs in the Study Area that could potentially be affected by dewatering

drawdown. If any springs are dewatered, the population in that spring would be lost unless it could be relocated.

Measures included in SOAP (BLM 1993), SOAPA (BLM 2002a), Leeville Project (BLM 2002b), and Betze/Post (BLM 2003) mitigation plans address potential adverse impacts, including dewatering impacts, without regard to whether they occur on public or private land. These mitigation measures are designed to provide not only protection of natural resources but also improvement of most resources in the area, including aquatic habitat. Measures in the plans that deal directly with dewatering include extensive groundwater monitoring and reporting protocols. Monitoring data are used to trigger implementation of mitigation measures, including stream flow augmentation for individual streams, seeps and streams if and when the cone of depression impacts groundwater recharge to those water resources (e.g., Maggie and Susie creeks stream flow augmentation plan). To date, implementation of mitigation plans has had a beneficial impact to fisheries and aquatic resources, including the Lahontan cutthroat trout, in the Study Area.

GRAZING MANAGEMENT AND AGRICULTURE

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for grazing management and agriculture is shown on **Figure 2-3.** Mining and livestock grazing are the dominant land use activities in the Carlin Trend. The rationale for the Study Area is based on the effect mine dewatering may have on the availability of water in springs, seeps, and streams used to provide water for livestock. The location and availability of water would be used to determine stocking rates and season of usage for pastures within the various allotments.

MONITORING DATA AND NEW INFORMATION (2002-2007)

During 2006, an average of 53 pivots were used to irrigate approximately 7,900 acres on the TS Ranch in the Boulder Valley. When dewatering operations are discontinued at Betze/Post and Leeville and dewatering water no longer flows to the TS Ranch reservoir, irrigation in Boulder valley will likely be reduced to 20 to 30 pivots (Pettit 2007).

CUMULATIVE EFFECTS

Grazing Management

Cumulative effects on grazing result from wildfire, introduction of noxious weeds, energy development, and mining activity. Mine development in the Study Area has converted approximately 33,000 acres from livestock grazing in 4 allotments within the Study Area to mining and related activities. Reasonably foreseeable mine development in the Study Area between 2007 and 2020 would add approximately 2,500 acres of mining and exploration disturbance. This additional disturbance would have minimal affect on grazing allotments as most development would occur within existing permitted boundaries where adjustments to grazing use have previously occurred. Continued mine dewatering in the Study Area could cause changes in groundwater levels, surface water flow, and/or water quality resulting in reduced stocking rates, livestock distribution, and/or forage utilization.

Construction of the TS Power Plant resulted in conversion of 723 acres of private land from grazing and wildlife habitat to industrial use (ENSR 2004b). The power plant would not affect grazing allotments administered by BLM because the project is occurring on private land in Boulder Valley.

Adjustment to the term grazing permit on the T Lazy S Allotment as a result of the SOAPA project has already been made. Reduction in permitted use for grazing extends through the life of the mine in most cases. Following reclamation, the majority of mine sites will be made available for grazing. In addition, these site are often more productive than adjacent native sites as native cultivars are used for reclamation, competition is limited to only those few species in the seed mixture.

Reclamation of mine related disturbances in the Study Area will be incremental as various operations reach the end of active mining and begin closure activities. Approximately 6,200 acres would remain as open pits, some partially filled with water. Approximately 29,300 acres would be reclaimed to provide livestock grazing.

From 1999 through 2006 about 55 percent (approximately 800,000 acres) of land encompassed by the 13 allotments comprising the Study Area have been affected by wildfire. Stocking rates and seasons of use are periodically reviewed and adjusted by BLM in response to the severity of burns in the various allotments effected. Restoration and reseeding efforts to mitigate losses from wildfire have had varying degrees of success. Some areas seeded during the first appropriate season following a fire (fall or winter) exhibited successful seedling establishment, while other areas became infested with noxious weeds (cheatgrass), re-burned within a year or two, or did not respond, possibly due to draught or other climatic conditions. Some areas had adequate native perennial grasses and did not require herbaceous reseeding following wildfires.

Other restoration projects have included fencing burned areas to allow vegetation to recover and adjusting stocking rates and seasonal use to reflect available forage in the various pastures within each effected allotment. Habitat restoration/reseeding projects from 2000 through 2006 within the Study Area resulted in reseeding a total of approximately 382,000 acres (approximately 55,000 private and 327,000 public).

Agriculture

Cumulative effects to agriculture would include a reduction in irrigated land in the Boulder Valley. Water currently provided by dewatering activities at Barrick's Betze/Post operation and Newmont's Leeville Mine will decrease at a rate commensurate with mining activity and eventually cease to be available for irrigation. At that point, irrigation in Boulder Valley would revert to pumping existing groundwater wells on the TS Ranch. These wells would support 20 to 30 pivots at current application rates (Pettit 2007) described in Chapter 2 –*Grazing and Agriculture*.

RECREATION

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for recreation covers the administrative area of the Elko Field Office as shown on **Figure 2-6**. The administrative area of the Elko Field Office encompasses communities where most of the population resides that use recreation facilities in the area.

MONITORING DATA AND NEW INFORMATION (2002-2007)

The Elko BLM Field Office maintains records on public usage of developed recreational sites within the administrative area. This information is available at the BLM office in Elko. Similar data are collected by Humboldt National Forest for use of developed recreational sites on National Forest System land.

CUMULATIVE EFFECTS

Dispersed recreation opportunities including off-highway vehicle use, hunting, hiking, and sightseeing in the vicinity of the Carlin Trend have been restricted since the early 1980s because of intensified mining and exploration activities in the Carlin Trend. Recent wildfires have further reduced the opportunity for recreation in northeast Nevada.

The gradual but continuous expansion of mining activities in the Carlin Trend would result in less area available for dispersed recreation activity during operation and after cessation of mining until reclamation is complete. Any increase in population associated with mine development would result in more demand for recreation on public land.

To date, recreational use of approximately 34,000 acres in the vicinity of the Carlin Trend has been restricted due to mine development. Reasonably foreseeable mine development from 2007 to 2020 in the Carlin Trend would affect an approximately 4,000 additional acres. Public access to these areas would be restricted to maintain safety and security during mine operations. Upon reclamation and closure these areas would be available for dispersed recreational use.

The overall changes in cumulative impact to recreation and hunting from past, present, and reasonably foreseeable mining related activities is likely to remain minimal, in part because of access restrictions related to mining areas currently exist and unrestricted areas adjacent to the Carlin Trend area remain available for dispersed recreational use.

Employment associated with mine operations, construction activity, and general population growth associated with employment in the Elko area affects the usage of recreational facilities throughout the Study Area. Downturns in employment result in an out migration of workers which in turn reduces the amount of usage of these areas.

ACCESS AND TRANSPORTATION

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for access and transportation includes Interstate 80, State Secondary Route 766, Union Pacific Railroad, and areas adjacent to past, present, and reasonably foreseeable mining operations. These are the primary transportation routes for goods and services in the Carlin Trend and areas where access may be affected by existing and future operations.

MONITORING DATA AND NEW INFORMATION (2002-2007)

According to the Nevada Department of Transportation annual average daily traffic count on State Route 766 north of Carlin between 1997 and 2006 ranged from a low of 1,850 in 2002 up to 2,650 in 2006 for an average of 2,250 vehicles over the 10-year period. This amounts to approximately 20 percent of the traffic volume on Interstate 80 between the Elko and Dunphy exits (NDOT 2007).

CUMULATIVE EFFECTS

Access

Foreseeable mine development would result in access restrictions in the vicinity of the Emigrant Mine. Other routes exist in this area that would allow public access to locations blocked by this proposed development.

Numerous two-track roads provide access throughout the Study Area to support livestock grazing operations and public access for recreational purposes. Future mining operations could preclude use of these routes.

Transportation

Cumulative effects on transportation result from increased mining activity, energy development, and increases in population. Rail traffic would increase incrementally as a result of the coal fired TS Power Plant north of Dunphy. An average of 75,000 tons of coal will be delivered by rail each month to the TS Power plant. In addition, a fuel depot located at Dunphy provides diesel fuel to mines in the Carlin Trend.

Trucks are used to transport a variety of materials to mine sites. Shipments of diesel fuel from Dunphy are transported 34 miles to the town of Carlin via Interstate 80. From Carlin, fuel is transported 15 miles along State Route 766, a rural two-lane road to mine access roads.

Future mine development would not likely increase mine related traffic because as activity at some mine areas decreases, other mines begin operation resulting in a relatively static level of employment and corresponding level of traffic. Traffic in the Study Area would be re-directed in response to future mine developments, such as Newmont's Emigrant Project which lies south of Interstate 80. The Emigrant Project would employ approximately 100 people during construction and about 180 people during mine operations. Most of the work force for the project would come from existing mine-related work forces in the Carlin area.

The majority of mine related traffic would continue to be directed toward Newmont's SOAPA and Barrick's Betze/Post areas for the foreseeable future. Both Newmont and Barrick offer bus transportation for employees from Elko to the mine sites.

VISUAL RESOURCES

Visual resources are evaluated within the context of BLM's Visual Resource Management program. This program has established categories of visual elements throughout the Elko Resource Area. BLM reviews proposed projects which are assessed against their surrounding landscape for compliance with this program.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for visual resources encompasses the Carlin Trend extending from the Hollister Mine in the north to the Emigrant Mine in the south. Key observation points are located along public access points or areas frequented by the public. The rationale for selecting this geographic area is the relationship between mining level disturbance (creation of open pits, waste rock disposal facilities, tailing storage facilities, haul roads, and ancillary mine facilities that modify the natural landscape) and the viewshed from various points where public access is established.

The Study Area is predominately located in a Visual Resource Management (VRM) Class IV area under BLM's VRM program. The objective of Class IV is to provide for managing activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. Management activities (e.g., developments) may dominate the view and be the major focus of viewer attention. Impacts of these activities are minimized through careful location, minimal disturbance, and repeating the basic elements (form, line, color, and texture). Class IV allows substantial modifications of the landscape but places emphasis on mitigation, where possible, of those impacts.

MONITORING DATA AND NEW INFORMATION (2002-2007)

No new visual simulations have been compiled since 2002. The Emigrant Mine would result in a modification of the natural landscape.

CUMULATIVE EFFECTS

Current and future mine development within the Carlin Trend would not exceed the visual prescriptions of the VRM Class IV designation. Reclamation measures are required for mine disturbances and reclamation would occur on current and future mining activities in the Carlin Trend. Major elements of certain mining facilities would remain after reclamation including pit highwalls and earth-fill structures. Visual contrasts in form, line, and color would remain in the post-mining landscape.

Mine development in the Carlin Trend has resulted in linear features comprised of mine pits, haul roads, waste rock disposal sites, heap leach pads, tailing storage facilities, and mills. Mine developments in many locations are not separable through visual observation. The linear characteristic of these mine developments is expected to be a visual element of the landscape for the foreseeable future.

Other land use activities or conditions within these viewsheds have affected and would continue to affect the visual characteristics of the landscape. Burned areas (range fires), power plants, powerlines, pipeline corridors, highways and roads, and livestock grazing affect the natural landscape to varying degrees and at varying seasons and duration. These land use activities and natural phenomena would likely continue to affect visual elements of the landscape into the future. Mitigation of all the visual impacts resulting from mining disturbance may not be possible to mitigate but the severity could be minimized through project design.

WASTE, SOLID AND HAZARDOUS

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for solid and hazardous wastes and hazardous materials encompasses the permitted mine sites shown on **Figure 2-7**.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Current and reasonably foreseeable levels of solid and hazardous waste and hazardous materials used, stored, transported and generated in the Carlin Trend are described in the *Mine and Mineral Development* section of Chapter 2.

CUMULATIVE EFFECTS

Hazardous materials may affect air, water, soil, and biological resources that could potentially be affected by an accidental release during transportation to and from the Carlin Trend and during storage and use at project sites. Solid and hazardous wastes and hazardous materials present in the Carlin Trend are currently transported, stored, and managed in accordance with applicable federal, state, and local regulations. Non-hazardous solid wastes are disposed in NDEP permitted Class III waivered landfills constructed on mine sites, generally within waste rock disposal facilities.

Trucks are used to transport a variety of hazardous waste and materials to and from mines in the Carlin Trend. Shipments of hazardous substances originate from locations such as Dunphy, Elko, Salt Lake City, and Reno and are transported to the town of Carlin via Interstate 80. From Carlin, the substances travel along State Route 766, a rural two-lane road to the respective mine access roads.

Based on total number of deliveries, the material of greatest concern is diesel fuel. The probability of an accident resulting in a release involving diesel fuel was calculated using Federal Highway Administration truck accident statistics (Rhyne 1994). According to these data, the average rate of truck accidents for transport along a rural interstate freeway is 0.64 accidents per million miles traveled. For rural two-lane roads (State Route 766), the average truck accident rate is 2.19 accidents per million miles traveled.

The probability analysis indicates that the potential for an accidental release of liquids during truck transport during the remaining life of the SOAPA Mine is less than one accident involving a spill of diesel fuel. The total number of truck deliveries of diesel fuel could increase by 500 times before an accidental spill would be expected. Newmont and Barrick have emergency response measures in place to remediate any spills.

To date, three spills are known to have occurred at the Maggie Creek narrows on Route 766. Spills include 2,000 gallons of diesel in 1999, 300 gallons of grease in 1997, and an unknown quantity of material from a cement truck in 1997. The turn in the road at Maggie Creek narrows is now equipped with flashing lights (McFarlane 2007).

Reasonably foreseeable future activities concerning solid and hazardous waste and hazardous materials are likely to remain at current levels or increase incrementally with expanded mine development. Typically as new mines come into production, others are entering closure and the overall quantity of these materials is maintained. Quantities of these materials used, stored, transported, and generated would begin to decline as reserves in the Carlin Trend are depleted and no new mines are developed.

NOISE

Noise associated with proposed activities on public land administered by BLM is evaluated to determine the potential impacts that could result from a source of noise in an otherwise ambient condition. Noise could impact sensitive receptors including human and animal. No specific noise standard has been adopted that would apply to conditions external to a facility. The Mine Safety and Health Administration and Occupational Safety and Health Administration regulate noise levels in the work place as those regulations apply to worker safety.

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) encompasses the active mining areas in the Carlin Trend (Barrick Betze/Post area to SOAPA). Noise results from mining and other activities including drilling, blasting, loading, hauling, and processing of ore and waste rock. These activities encompass a wide range of noise levels which are affected by mobility of the source of noise (truck haulage), topography of the area (blocking noise), temperature of the air (cold air transmits noise more efficiently than warm air), and frequency of the source (blasting vs. milling operations). Distance to sensitive receptors also affects analysis of whether noise generated by a specific activity would be a nuisance.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Noise generated by mining and ore-processing activities in the Carlin Trend has changed over time with the advancement of exploration and mining operations. Noise generated by drilling equipment, blasting, truck haulage or ore and waste rock, and milling operations has affected ambient noise levels that existed prior to major mine development in the Carlin Trend. Noise generated from these activities ranges from

infrequent noise resulting from blasting of rock in mine pits; periodic noise associated with haul truck traffic; and constant noise associated with milling operations. Noise levels associated with exploration and mining activity and locations of sensitive receptors are described in the SOAPA EIS (BLM 2002a).

Proposed development of Great Basin Gold's Hollister Development Block would create a source of noise during construction and operation of the proposed mine. The proposed project is an underground mine and consequently, noise associated with blasting would not be noticeable at the surface; especially as workings advance to depth. Noise associated with surface operations is not known at this time and is dependent on the mine and ore processing plans currently in development.

Other sources of noise in the Study Area include off-highway vehicles, firearms, and highway traffic. No monitoring data are available to characterize these sources.

CUMULATIVE EFFECTS

Noise does not accumulate in the environment; it can have a direct impact on sensitive receptors but it does not form an additive or cumulative effect on the environment. No cumulative effects from noise in the Study Area have been determined.

SOCIAL AND ECONOMIC RESOURCES

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for social and economic resources encompasses the area between Elko and Winnemucca on Interstate 80, including Elko, Eureka, Lander, and Humboldt counties (**Figure 3-8**). The rationale for selection of this Study Area is outlined below:

- Residential patterns of mining company employees determine where they are likely to spend their salaries. Employees of mining companies do not necessarily live in the closest community to their employment nor do they live in the local governmental unit which receives increased tax revenues as a result of the facility. According to Sonoran Institute (2007), commuting data suggest that:
    - Elko County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 15.5 percent of total income in the county.
    - Lander County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 8.2 percent of total income in the county.
    - Eureka County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents approximately 600 percent of total income in the county.
    - Humboldt County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents 5.6 percent of total income in the county.
- Availability of local shopping opportunities determines where people are likely to spend their disposal income in the four-county Study Area. The majority of shopping opportunities, including availability

of medical, financial, and personal services, are located in Elko (Elko County) and Winnemucca (Humboldt County). Dollars from Carlin and Battle Mountain "bleed" out of Eureka and Lander counties to Winnemucca and Elko.

- Most communities within the four-county area have a distinct sense of being a "local community" while sharing basic values and beliefs. Towns in the Study Area are remote from the rest of the state, connected by Interstate 80.

MONITORING DATA AND NEW INFORMATION (2002-2007)

The following sections provide updated baseline data on social and economic resources, where available.

Population Trends and Demographic Characteristics

The Study Area contains predominantly white communities, with Hispanic, Basque, and American Indian (mostly members of the Te-Moak Tribe of Western Shoshone) populations. Nevada is one of the fastest growing states in the U.S. (24.9% since 2000 Census). The two largest counties (Elko and Humboldt) have shown modest growth, while the two smallest counties (Lander and Eureka) lost population during the same period (**Table 3-13**). The towns of Elko (Elko County) and Winnemucca (Humboldt County) are well-developed and growing communities on either side of the Study Area, with smaller communities of Carlin and Battle Mountain in between Elko and Winnemucca.

Housing

The number of housing units available has not kept pace with population growth experienced in Elko and Humboldt counties from 2000 to 2005 (**Table 3-14**).

Government and Public Finance

Residents of the Study Area are governed by elected county commissioners and city councils if they live within municipal boundaries. Residents of the Elko and Battle Mountain Bands elect Tribal Councils.

The state of Nevada collects taxes on a multitude of items, including gaming, sales, and use taxes. Mining is one of the highest taxed industries in the state and the only industry that pays taxes to state and local governments on the basis of "net proceeds," a classification in which proceeds from non-metal mining production is taxed. Mineral operations are allowed to deduct direct costs of production, such as mining and milling, and are taxed on the net amount (Newmont 2005).

Table 3-15 presents the amount of net proceeds tax distributed to counties in which it was earned for 1999 through 2006. Mining activity has increased in Eureka and Humboldt counties, and has decreased in Elko and Lander counties over the same period. This is common in the Study Area as mines close and new mines are developed. In Fiscal Year 1999-2000, mining in the Study Area contributed to over 88 percent of net proceeds in the state; by 2006, mining contributed only 65 percent of net proceeds in the state.

In addition to the net proceeds tax, mining generates tax revenue for government in various ways:

- Net Proceeds Tax on Royalties, based on royalties received if one company owns the mineral rights on land mined by another company.

- Property Tax, based on personal property (such as equipment) and real property (buildings) and paid to a city or county.

U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

SOCIOECONOMIC RESOURCES
CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-8

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TABLE 3-13 General Demographic Information					
Characteristic	Elko County	Eureka County	Lander County	Humboldt County	State of Nevada
Total population (2006 estimate)	47,114	1,480	5,272	17,446	2,495,529
Percent Population change (April 1, 2000 to July 1, 2006)	4.0	-10.4	-9.0	8.3	24.9
Percent White, not Latino (2005)	70.9	83.2	77.5	73.2	60.0
Percent Latino (2005)	21.7	12.7	16.9	20.1	23.5
Percent Black (2005)	0.9	0.4	0.5	0.6	7.7
Percent American Indian and Alaska Native persons, percent, 2005	5.6	1.0	4.7	5.0	1.4

Source: U.S. Census Bureau, 2007.

TABLE 3-14 Housing Data, 2000 and 2005					
Characteristic	Elko County	Eureka County	Lander County	Humboldt County	State of Nevada
Total Housing Units (2005)	19,066	1,064	2,765	7,030	1,019,427
Percent Change (April 1, 2000 to July 1, 2005)	3.3	3.8	-0.5	1.1	23.2
Median Value of Owner-Occupied Housing Units, 2000	$123,100	$89,200	$82,400	$117,400	$142,000

Source: U.S. Census Bureau 2007.

TABLE 3-15 Net Proceeds of Minerals Tax Distribution (in dollars), 2000 - 2006					
Fiscal Year	Elko	Eureka	Lander	Humboldt	State of Nevada/Total County Distribution
1999-2000	$3,189,780	$1,911,738	$7,644,328	$59,589	$14,525,017
2000-2001	2,891,062	2,968,354	5,822,029	496,667	14,114,324
2001-2002	1,264,908	1,278,428	5,656,449	535,710	11,425.034
2002-2003	1,561,131	1,222,059	4,725,660	1,076,801	13,756,888
2004	2,049,505	3,331,918	6,415,111	1,577,453	19,093,251
2005	2,003,547	3,356,887	9,505,593	191,595	21,886,103
2006	2,044,142	5,272,665	6,602,800	1,333,320	23,357,518
Percent Change 2000-2006	-35.9%	175.8%	-13.6%	213.8%	150.8%

Source: Nevada Department of Taxation 2007.

- Sales Tax, based on goods and services purchased from Nevada registered vendors and paid where goods and services are delivered.
- Use Tax, based on purchases from non-Nevada registered vendors, paid at point of final destination.
- Excise Tax, based on purchases of specific commodities such as diesel fuel and paid as part of the bill for the product.
- Payroll Tax, based on direct employee payroll and paid to relevant government agencies.
- Federal income tax based on an individual company's corporate-wide profits, and filed and paid in a consolidated global return to the U.S. Treasury.

Employment

The economy of the Study Area is dominated by government and the mining industry. Nevada has led the nation in production of gold, silver, and barite; and Elko, Eureka, Lander, and Humboldt counties contribute to Nevada's overall mining employment. Mine related employment in the Study Area comprised over 60 percent of Nevada's mining jobs in 2003 (Sonoran Institute 2007). Updated employment information is presented in **Table 3-16**.

Income

Mining provides its employees with the highest average salary of any industry in Nevada. The average salary paid to mine workers in the Carlin Trend was $58,200 in 2006 across all counties in the Study Area (**Table 3-17**).

Goods and Services

Detailed Information regarding total expenditures by Barrick and Newmont within the Study Area is not available, however data for the broad categories of contracted services, consumables, and supplies was provided. Information for contracted services, consumables, and supplies for Halliburton's Rossi Mine or Great Basin Gold's Hollister Development Block was not available.

Newmont and Barrick collectively spend in excess of $310 million annually on contracted services. The number of contractors for each company varies seasonally but ranges from 400 to 600. Total consumables (e.g., diesel fuel, gasoline, propane, and cyanide) exceed $650 million for Newmont and Barrick operations combined. Expenditures for supplies (e.g., office supplies, safety equipment, vehicle and equipment parts) range from $35 million to $78 million for Barrick and Newmont, respectively (Newmont 2007j; Barrick 2007e).

CUMULATIVE EFFECTS

Characteristics of the socioeconomic environment that could have cumulative impacts from the remaining development associated with SOAPA and other reasonably foreseeable projects in the area include population variations, availability of housing, public infrastructure and services, employment levels, tax revenues, and the effects of discharge and dewatering within in the Carlin Trend and the Humboldt River Basin. Chapter 2 – *Past, Present, and Reasonably Foreseeable Future Activities,* describes land uses that affect socioeconomic resources.

Population Trends and Demographic Characteristics

The number and variety of reasonably foreseeable projects planned in the Study Area would not likely result in additional workers moving into the area.

TABLE 3-16
Employment Data, 2003

Characteristic	Elko	Eureka[1]	Lander	Humboldt	State of Nevada
Total employment, all industries, 2003	14,532	3,540	1,141	5,412	949,334
Natural Resources and Mining , number of jobs, 2003	1,421	3,180	527	1,543	10,893
Natural Resources and Mining, percent of total	9.8%	89.9%	46.2%	28.5%	1.1%
Newmont employment, 2006[2]	218	2,298	405	602	3,526
Newmont employment, percent of Natural Resources and Mining	15.3%	72.3%	76.9%	39.0%	32.4%
Barrick employment, 2006[3]	290	1,529	514	312	2,860
Barrick employment, percent of Natural Resources and Mining	20.4%	48%	97.5%	20.2%	26.2%

Source: Sonoran Institute 2007.
[1] Information on Eureka County from the Nevada Department of Employment, Training, and Rehabilitation 2007
[2] Newmont 2007j.
[3] Barrick 2007d.

TABLE 3-17
Income and Earnings Data

Characteristic	Elko County	Eureka County	Lander County	Humboldt County	State of Nevada
Mean household income, 2004[1]	$52,202	$42,790	$49,257	$47,532	$47,231
Average Annual Wages, all industries, 2003[2]	$29,128	$65,103	$39,769	$34,442	$34,320
Average Annual Wages, Natural Resources & Mining, 2003[2]	$56,116	$66,924[3]	$58,982	$58,523	$55,345

Source:
[1] U.S. Census Bureau 2007,
[2] Sonoran Institute 2007.
[3] Nevada Department of Employment, Training, and Rehabilitation 2007.

Transient workers are often involved in the construction of mines and related facilities. These workers are less likely to become part of the community through activities or socializing and they face a stigma for not being long time members of the community.

Prostitution is legal and regulated by the State in the Study Area. The Battle Mountain Social Impact Assessment (Newmont 2005) reported that prostitution does not seem to have a significant impact on social cohesion as it was not identified during discussions in the Battle Mountain community. Prostitution is impacted by the mining industry mainly through influx of contractors during construction phases of large-scale projects. These contractors are generally single men, or men who have left their families temporarily for work. These men tend to frequent local bars and gaming establishments.

Housing

Long-term housing impacts generated by the remaining development of SOAPA combined with other reasonably foreseeable projects in the Study Area depend in large part on where people (construction and operational workers) choose to live. The majority of workers in the Study Area live in Elko and Humboldt counties and commute to work in Eureka and Lander counties. Lack of new housing to meet current demand throughout the Study Area could create the need to build sub-standard homes – built to house people during a boom – but which later become blights which generate little to no property tax revenue, but continue to put pressure on public infrastructure and services budgets (Newmont 2005). **Table 3-14** presents housing data for 2000 and 2005. Housing in Eureka and Lander counties is less expensive than housing in Elko and Humboldt counties. This may be because much of the housing in Eureka and Lander counties consists of trailers, mobile homes, and pre-fabricated units built for a transitional group of home buyers.

The Battle Mountain Social Impact Assessment (Newmont 2005) indicates real estate markets and property values are determined by the quantity and perception of supply and demand. Perception in Battle Mountain in early 2005 was that the community was going through a boom and new, temporary, and permanent residents to the town required housing. The effect is often an increase in property values of existing structures and an added impetus for adding housing units. However, unrealistic speculation about home prices on the part of sellers and an overall trend of rising property values can price some people out, negatively affecting the availability and affordability of housing. In addition, previous experience throughout the Study Area is that property values dropped precipitously when mines have closed, with many owners choosing to abandon their properties and allow foreclosure given an inability to sell homes even at depreciated values (Newmont 2005).

In anticipation of the TS Power Plant, Newmont has created additional housing supply with redevelopment of a trailer park in Battle Mountain. However, the construction of the Power Plant has brought upwards of 900 contractors and has put pressure on availability of local housing.

Public Infrastructure and Services

Rapid population growth and loss (boom/bust cycles) also place a burden on fire, police, and Emergency Medical Services response to public safety incidents. Government agencies throughout the Study Area struggle with recruiting and retaining qualified personnel as many are drawn by the comparatively high wages of the mines.

The influx/loss of school-aged children into local school districts is also a major concern for local planners. With a state mandate of class sizes of 16 in elementary and middle schools, the addition of several new students could necessitate hiring additional teachers. Funding for the school districts is awarded on "two-year hold harmless," which compensates districts for either their actual student population or the student population in either of the two previous years, whichever is higher. The Nevada legislature is currently considering legislation to revise it to a "one year hold harmless."

Employment

The economic multiplier from mining is been estimated to be 1.7, although there is support for a range of 1.5 to 1.9 in some literature (Harrington 2005). In addition to future mine development in the Carlin Trend, the new TS Power Plant near Dunphy, and rail terminals in Elko and Winnemucca, will provide additional employment. These private sector investments

will result in substantial contributions to employment levels in the Study Area.

Cumulative impacts on employment and income in the Study Area are dependent on timing of job openings because job losses may be offset or at least mitigated by new projects. However, there is no guarantee the closure of one project and the construction/operation of another project will be offset in sequence or in number of jobs and economic opportunities. If any of the existing projects were to close without one of the reasonably foreseeable projects coming online, communities in the Study Area would be impacted as some people would lose their jobs and incomes.

Goods and Services

Sustainable development begins with contractors and suppliers because they have the freedom to sell to others while maintaining a reliable contract with a known client. Although Newmont has proactively procured supplies and services from some local contractors (e.g., 3D Concrete, through negotiation of Newmont's contractor insurance requirements) and has proactively incubated some regional businesses (e.g., trucking contract with the Duckwater tribe, through flexible financing and payment arrangements), these success stories could be replicated by improving the transparency and consistency of Newmont's disclosure of procurement opportunities (Newmont 2005).

Tax Revenues

In addition to employment taxes, net proceeds taxes paid by mineral development are a primary tax revenue source. Net proceeds taxes are generated for the state of Nevada in the county where the ore is mined, not the county where employees live. Companies pay property and sales taxes, and employees and supply chain contractors who reside locally generate tax revenue through their property and local purchases. For example, net proceeds are generated in Eureka County by the multitude of mining activities but the majority of employees live in Elko County.

Mining activity (and resulting net proceeds tax revenues) has consistently increased in Eureka and Humboldt counties, and has fluctuated but decreased in Elko and Lander counties between FY 1999 - 2006. This is common in the Study Area as old mines go into closure and new mines are developed. The fluctuation in revenue stream has led to uncertainty about revenues into county budgets and the ability to fund public projects (Newmont 2005).

The majority of net proceeds tax benefits will accrue to Eureka and Humboldt counties where most mining activity occurs. Property tax from miners' homes and suppliers' businesses is the primary tax revenue Elko County receives from mining. The Battle Mountain Social Impact Assessment (Newmont 2005) provides a description of the potential impact of net proceeds tax:

> "In 2004, net proceeds taxes (largely from the non-Newmont Cortez mine) represented 16.00% of the $7,232,223.00 Lander County budget. Once Phoenix begins operations, Lander County is expected to receive approximately $1.4 million annually in taxes, which would have represented 19.36% of total Lander County revenue in 2004. Since 2000, Lander County has used net proceeds revenue to cover its operating expenses. A loss in this revenue stream would require cuts in county administration and basic services. In addition, Lander County's weak tax base (due to low-value and non-assessed residences and economic leakage of resident income) also makes it more dependent on the direct net proceeds and property tax revenue streams from Newmont. Unless the tax

> revenue streams associated with Phoenix mine are offset by other mines or employers and/or a more diversified tax base, Lander County's financial solvency will be vulnerable at the closure of Phoenix, potentially throwing Battle Mountain and the surrounding area back into the familiar "boom bust" economic cycle" (Newmont 2005).

Net proceeds tax is clearly a vital part of county revenue. Counties that have mining benefit; counties that house and provide services to miners must find the money to provide those services from other sources.

Dewatering and Discharge

Areas potentially affected by mine dewatering are described in the SOAPA EIS (BLM 2002a), Leeville EIS (BLM 2002b), and the CIA report (BLM 2000). Socioeconomic concerns in this area include potential impacts from lowered water levels in wells, reduced flow in springs (livestock and wildlife impacts), reduced stream flow (irrigation and livestock impacts), and development of sinkholes (possible damage to private property and/or natural resources) (BLM 2002a). Details regarding groundwater and surface water conditions in the Study Area are included in this chapter under the *Water Quantity and Quality* section.

ENVIRONMENTAL JUSTICE

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for environmental justice encompasses the area between Elko and Winnemucca on Interstate 80, including Elko (including the Elko Band Colony), Eureka, Lander (including the Battle Mountain Band), and Humboldt counties. Both bands are part of the Te-Moak Tribe of Western Shoshone Indians. These bands represent minority populations within the vicinity of the Carlin Trend.

MONITORING DATA AND NEW INFORMATION (2002-2007)

No new census data for the period 2002 to 2007 has been collected. Information contained in this section is based on the most recent census (2000).

IDENTIFICATION OF MINORITY AND LOW INCOME POPULATIONS

Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders. *Low-income populations* are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family of four was $17,603 and $8,794 for an unrelated individual (U.S. Census Bureau 2002). Estimates of these two populations were then developed to determine if environmental justice populations exist in the Study Area.

The Council on Environmental Quality identifies these groups as environmental justice populations when either (1) the minority or low-income population of the affected area exceeds 50 percent or (2) the minority or low-income population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis. In order to be classified meaningfully greater, a formula describing the environmental justice threshold as being 10 percent above the State of Nevada rate is applied to local minority and low-income rates.

In 2006, the Study Area contained 71,312 persons, of which approximately 19,821 (28%) were minorities and approximately 6,443 (9%) were living below the poverty level. Minority and low-income populations were consistently lower in each of the counties in the Study Area than for the State of Nevada (**Table 3-18**). The

Elko Band Colony in Elko County and the Battle Mountain Band of the Te-Moak Western Shoshone tribe in Lander County meet the description of environmental justice populations, both because of minority and poverty status (**Table 3-18**). For each Band the percent of minority persons and the percent of people below the poverty level are more than 10 percent above the State of Nevada rate.

Cumulative impacts due to construction and operation of reasonably foreseeable mine projects, combined with past and present activities in the Carlin Trend to these tribes, were evaluated and described in the *Native American Religious Concerns* section of this chapter.

CULTURAL RESOURCES

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) and Area of Potential Effect for cultural resources extends from the Bootstrap Mine in the north to the SOAPA Project in the south (**Figure 3-9**). The Study Area boundary was determined by the BLM to include those mines and related facilities that encompass the core area of the Carlin Trend, including areas currently subjected to open pit and underground mining activities.

MONITORING DATA AND NEW INFORMATION (2002-2007)

A summary of cultural resource inventories organized by company name/mine operator is presented in **Table 3-19**. A complete listing of all cultural surveys completed in the Carlin Trend is included as **Appendix C.**

Since 2002, the SOAPA project has been implemented as described in Chapter 1 – *Project History and Status.* Mine expansion is underway and new facilities have been constructed and placed in operation. Other projects have been constructed within the Carlin Trend during the period (see Chapter 2 – *Mine and Mineral Development*). Cultural resource surveys were completed prior to initiation of these projects (see SOAPA EIS (BLM 2002a) and Leeville EIS (BLM 2002b)).

Prior to 2007, 65 Cultural Resource Inventories/Reports had been prepared in the Study Area (**Appendix C**). Barrick and Newmont are planning projects for which cultural surveys have been compiled or will be prepared in the future.

Approximately 2,560 acres would be disturbed in the Study Area between 2007 and 2020 by reasonably foreseeable projects (**Table 2-2**). (Note: The Emigrant/Rain area is outside the Study Area for cultural resources). The 2,560 acres within the Study Area have been previously surveyed with five sites identified as potentially eligible for listing on the National Register of Historic Places. Barrick is currently mitigating these sites as part of its Betze/Post expansion (Hockett 2007).

CUMULATIVE EFFECTS

Compliance with Section 106 of the National Historic Preservation Act has minimized impacts to cultural resources in the Area of Potential Effect as a result of mining disturbance. Cultural resource inventories are completed by professional archaeologists (3rd party contractors) that meet BLM and State Historic Preservation Office requirements prior to any mining-related disturbance. Contractors report results of surveys to BLM including recommendations of site eligibility and potential project effects to cultural resources. These reports are listed in **Table C-1 (Appendix C)** and on file at the BLM Elko Field Office. BLM reviews the contractor recommendations when making final determinations of site eligibility and project effects. These survey reports, along

TABLE 3-18 Minority Populations and Low-Income Populations, 2000			
Location	**Total Population**	**Percent Minority**	**Percent Below Poverty (1999)**
Elko County[1]	47,114	29.1	8.7
Elko Band Colony[2]	*730*	*86%*	*23.0*
Eureka County[1]	1,480	16.8	9.0
Lander County[1]	17,446	26.8	9.8
Battle Mountain Band[2]	*124*	*90.0*	*28%*
Humboldt County[1]	5,272	22.5	9.5
State of Nevada[1]	2,495,529	40.0	11.1

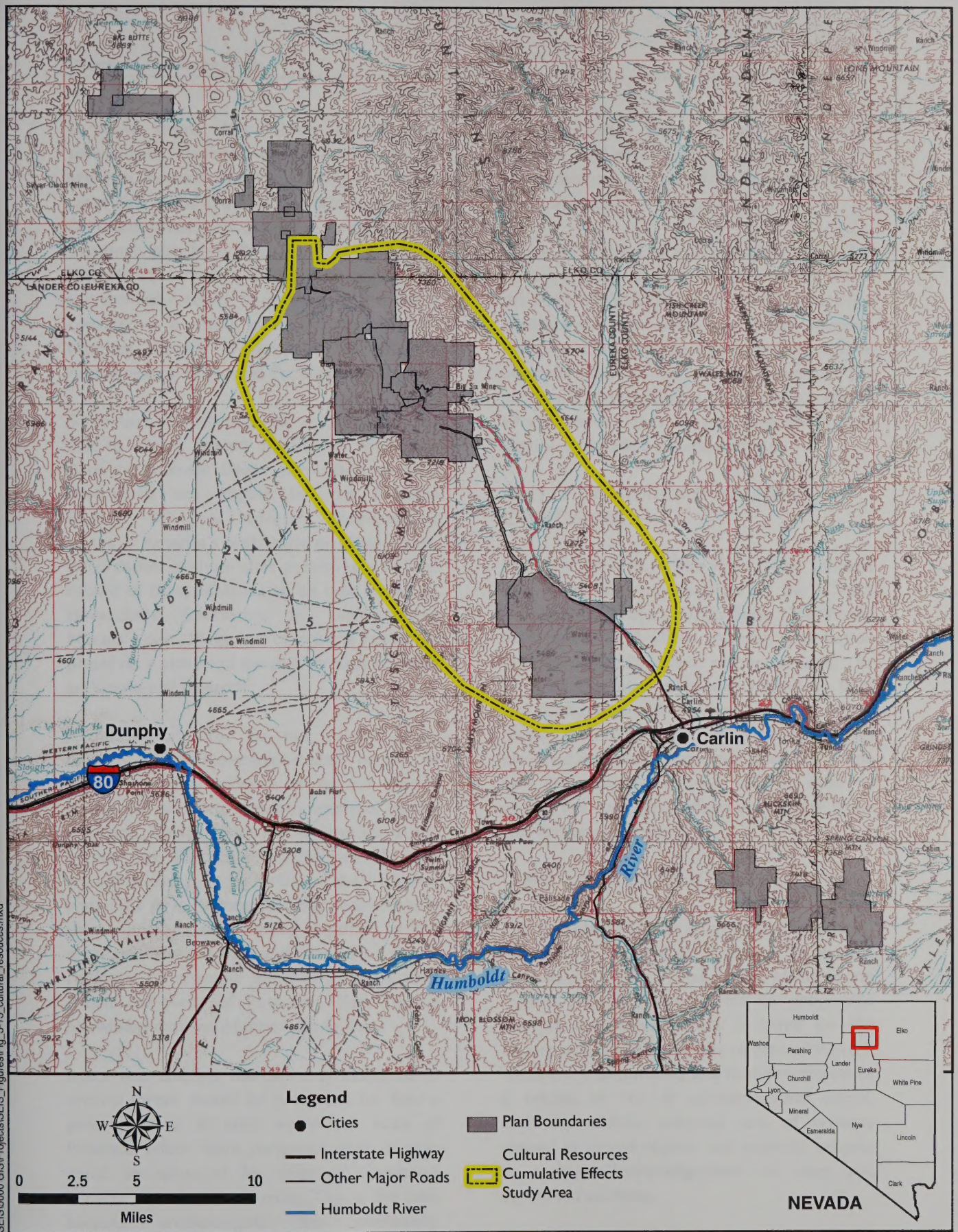
Source: [1] U.S. Census Bureau, 2007;
[2] Sonoran Institute 2007.

TABLE 3-19 Summary of Cultural Resources Inventories by Mine Operator	
Barrick Goldstrike Mines Inc.	10 Cultural Resource Inventories/Reports
	248 Sites or Isolated Finds
	45 Eligible Sites, 37 Unevaluated, 166 Ineligible
Marigold Mining Co.	6 Cultural Resource Inventories/Reports
	55 Sites, 40 Isolated Finds
	15 Eligible Sites, 1 Unevaluated Site, 39 Ineligible
Newmont Mining Corp.	34 Cultural Resource Inventories/Reports
	343 Sites or Isolated Finds
	79 Eligible Sites, 6 Unevaluated, 272 Ineligible
Other	15 Cultural Resource Inventories/Reports
	90 Sites or Isolated Finds
	16 Eligible Sites, 20 Unevaluated, 54 Ineligible

with BLM's final determinations, are submitted to the Nevada State Historic Preservation Office for review consultation, and inclusion into the Statewide Inventory.

Avoidance of sites determined eligible for the National Register is the preferred mitigation measure when sites are threatened. When possible, mining-related facilities are redesigned to avoid eligible sites or specific cultural resources. Due to the number of eligible sites present, avoidance is not always possible. In such cases, excavation by archaeologists is undertaken to mitigate adverse effects. Archaeologists prepare mitigation plans including a scope of work and specific scientific issues to be addressed as a result of the excavation for submittal to BLM. Approved plans are submitted by BLM to the State Historic Preservation Office for consultation. Upon final approval by BLM excavation and field work commence in accordance with the approved plan.

Analysis of artifacts recovered from site investigations are contained in reports to BLM and subsequently to State Historic Preservation Office for inclusion in the Statewide Inventory. Mitigation has been carried out at 57 of the 155 sites determined eligible for the National Register (37%). Approximately two-thirds of all eligible sites recorded within the Area of Potential Effect remain available for future research. A listing of mitigated sites is contained in **Table C-2 (Appendix C)**.



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U.S. Department of the Interior
Bureau of Land Management
Elko Field Office
Elko, Nevada

CULTURAL RESOURCES AND AREA OF POTENTIAL EFFECT CUMULATIVE EFFECTS STUDY AREA
SOAPA Project
Draft Supplemental EIS
Eureka and Elko Counties, Nevada

FIGURE
3-9

In some cases, sites initially avoided, are subsequently damaged during mining related activities. In such instances, mining companies cease operations in the area, inform appropriate BLM authorities, and develop a mitigation and treatment plan for submittal to BLM and State Historic Preservation Office. Subsequent field and archival research completed for the site is compiled in a report in accordance with the National Historic Preservation Act and the Archaeological Resources Protection Act.

Some loss to archaeological resources occurs due to mining related disturbance within the Area of Potential Effect, particularly to sites determined not eligible for the National Register. All sites represent nonrenewable pieces of America's prehistoric or historic past. Recordation of these sites preserves a written record of their existence to be used by future researchers interested in understanding Nevada's past. Mitigation of cultural resources preserves a picture of the past through scientific archaeological research.

Archaeological sites do not remain intact forever. The paleo-environmental record of Nevada exhibits evidence of natural erosive forces that eradicate previous traces of human presence. These erosive forces continue to the present day. The fact that 3,000-year old sites are visible today on the surface of the landscape within the Area of Potential Effect indicates that these sites are slowly being exposed by the erosional forces of wind and water. As a result, recovery of scientific information from sites within the Area of Potential Effect reveals knowledge that would otherwise be lost.

Intact sites that are not currently subjected to erosive forces should be preserved for future generations. If all sites within the Area of Potential Effect were mitigated, then a case could be advanced for negative cumulative impacts to cultural resources. This is the case because archaeologists are continually identifying new issues about past human behavior, and new research methodologies are being advanced that may provide additional data about sites under investigation.

While some loss of archaeological values has occurred due to mining-related activities within the Area of Potential Effect from a cumulative perspective, this loss has been minimal. Reasonably foreseeable future actions include potential impacts to sites. However, the process in place mitigates direct and cumulative effects, which, leads to increased information regarding Nevada's cultural heritage.

NATIVE AMERICAN RELIGIOUS CONCERNS

In March 2007, BLM Elko Field Office solicited input from local tribal entities for the SOAPA and Leeville Project Draft SEISs. Specifically, BLM stated "BLM wishes to gather information regarding specific tribal resources, sites, or activities that may have been missed by BLM and participating tribal groups and individuals, during the 2002 effort, or that have been identified or possibly impacted since 2002. Any new information provided will be used to update the cumulative effects analysis for these two authorized actions."

CUMULATIVE EFFECTS STUDY AREA

The Cumulative Effects Study Area (Study Area) for Native American Religious Concerns includes the hydrographic basins identified on **Figure 3-2**. The rationale for the geographic area of cumulative effects is based on the importance of water sources to Newe/Western Shoshone traditionalists and land disturbance as it relates to loss of edible/medicinal plants, minerals, wildlife, potential loss of artifacts viewed as sacred objects and potential impacts to traditional/cultural/spiritual use sites and associated activities.

MONITORING DATA AND NEW INFORMATION (2002-2007)

Past consultation with Tribal communities resulted in identification of two Traditional Cultural Properties in the vicinity of the Carlin Trend: 1) a location along Rock Creek; and 2) the Tosawihi Quarries.

BLM periodically contacts the various Tribes and Tribal representatives to solicit input to decisions made by BLM on internal and externally generated projects. Recent solicitation with Tribal members within the identified Study Area for Native American Religious Concerns includes:

- Hollister Development Block Project 2002-2004: Underground exploration near Tosawihi Quarries Traditional Cultural Property (TCP) and Archaeological District;
- Esmeralda Fire 2005: Fire burned contributing element (Big Butte) of Tosawihi Quarries Traditional Cultural Property;
- Winters Fire 2006: Fire burned north of Tosawihi Quarries TCP and Archaeological District;
- Sheep Fire 2006: Fire burned near Rock Creek TCP;
- Ivanhoe/Buttercup Spring Protection (contributing element to Tosawihi Quarries TCP) – Exclosure - 2007: Supplemental to Barrick Betze Plan of Operations of 2003 – Dewatering Mitigation; and
- Barrick Expansion - Goldstrike Mine (Betze Project) – 2007.

The following information was received from tribal coordination/communications for the projects noted above.

Tribal members are concerned about impact fires and fire suppression activities have had directly to artifacts and medicinal/edible plant species. According to the tribes, data gathering and excavation of sites, as mitigation, are not acceptable, unless artifacts are returned to the Shoshone people and Shoshone participate in the excavations or are able to observe the activities. However, BLM must curate them to the Nevada State Museum and, according to cultural resource laws; artifacts taken from BLM- administered land are considered the property of the federal government. Therefore, BLM "mitigating" sites via excavation and data gathering may be considered an adverse impact to tribal sacred sites and associated sacred objects (artifacts), when viewed from a traditional Western Shoshone perspective. Loan agreements can be negotiated if the requesting tribes have the facilities and expertise to house the artifacts. Tribally designated observers have been used in the past when data gathering is the only option for preserving artifacts.

Tribal members have provided input to the types of fire suppression tactics to be used when fires occur within or near the two identified Traditional Cultural Properties. They request that fires be allowed to burn naturally, as they have for thousands of years. Tribal members do not want heavy equipment disturbing sites and have stated that impacts to most artifacts (stone tools) by fire are quite minimal. Normal fire fighting techniques such as cutting fire line with hand tools, use of heavy equipment, and air tankers dropping red mud or "slurry" would cause more of an adverse impact than allowing fires to burn through.

Impacts to edible/medicinal plant populations, within the Study Area, are unknown as BLM does not regularly monitor these species nor do most BLM personnel know how to identify them. BLM relies on tribal members to determine the locations and document changes to such plant populations. In general, tribal

members note a decline in the number of edible and medicinal plant species across northern Nevada. "Yompa" and "Doza" are particularly difficult to locate. Whether the SOAPA mining action has had an adverse impact is not known. Perhaps the greatest impact occurs via wildfire, drought, cheat grass invasion, and livestock grazing.

Water source health, especially those within or near the Traditional Cultural Property areas, is a critical element in the maintenance of the spiritual integrity of those sacred sites. Western Shoshone have asked that they have an opportunity to participate in the design and creation of any spring or headwater protection projects within or near the identified Traditional Cultural Properties.

Mine development in the Study Area has removed native vegetation from approximately 33,000 acres since inception of large scale mining (see *Mine and Mineral Development* section in Chapter 2). An undetermined number of plants of Tribal concern have been affected by current mining. Similarly, wildfire has burned several thousand acres (see *Wildfires and Reseeding* section in Chapter 2) in and around the Study Area resulting in the loss of an undetermined amount of plants that are of importance to Tribe traditionalists. Livestock grazing continues to be a dominant land use that also likely affects many types of plants important to Tribal traditionalists.

Consultation with the various Tribal communities is described in the SOAPA EIS (BLM 2002a). Consultations completed during preparation of the SOAPA EIS identified the following concerns:

- Ground disturbance – impacts to spiritual energy and spirits, loss of edible and medicinal plants, and minerals used by traditionalists.
- Dewatering – Potential impacts to water sources and riparian areas from dewatering activities, medicinal/edible plant gathering, water spirits, and cleansing ceremonies (Tosawihi Quarry area springs and Rock Creek and associated springs – Traditional Cultural Properties).
- Artifacts – Powerful and sacred objects; artifacts used by traditionalists in healing practices; collection by looters and BLM approved data gathering of artifacts denies traditionalists the use of these powerful objects.
- Sage Grouse – Tribal participants noted that sage grouse populations appear to be decreasing (possibly due to fires and mining operations).
- Adequate water flow in Rock Creek.

CUMULATIVE EFFECTS

Located within the traditional territory of the Western Shoshone, the Study Area for Native American Religious Concerns contains spiritual/traditional/cultural resources, sites and social practices that aid in maintaining and strengthening social, cultural and spiritual integrity. Recognized tribal entities with known interests in the Study Area are the Te-Moak Tribe of Western Shoshone and the four constituent Bands (Elko, Battle Mountain, Wells, and South Fork) and the Duck Valley Sho-Pai Tribes of Idaho and Nevada. Various community members and families from those tribes and bands have also identified themselves as belonging to the original Tosawihi Band of Shoshone (whose traditional territory generally lies north of Battle Mountain, to Golconda, Midas, Tuscarora, and Dunphy.

Some Western Shoshone have expressed a concern that cumulative effects may occur to their spiritual life and cosmology. Development

of new projects that disturb stream flows, vegetation patterns, and wildlife distribution individually and collectively could impact the integrity of power spots, disrupt the flow of spiritual power (Puha), and cause the displacement of spirits (e.g., Little Men and Water Babies). Any such impact would limit potential for Western Shoshone to participate in traditional religious activities (BLM 2002a).

Contributing elements that assist in maintaining social and spiritual integrity include, but are not limited to: Existing antelope traps; certain mountain tops used for prayer, guidance, and reflection; medicinal and edible plant gathering locations; prehistoric and historic village sites and gravesites; sites associated with creation stories; hot and cold springs; material used for making baskets and cradle boards; locations of stone tools such as points and grinding stones (mono and matate); chert and obsidian quarries; hunting sites; sage grouse leks; sweat lodge locations; locations of pine nut ceremonies, traditional gathering, and camping sites; rocks or boulders used for offerings and medicine gathering; tribally identified Traditional Cultural Properties; Traditional Cultural Properties found to be eligible to the National Register of Historic Places; rock shelters; locations of "rock art"; land that is near, within, or bordering current reservation boundaries; land that conflicts with tribal acquisition efforts involving the Nevada Congressional Delegation; and water sources in general, which are often considered the "life blood of the Earth and all who dwell upon it."

Information concerning potential effects of mining including dewatering activities associated with mine operations and potential impacts to vegetation and sage grouse in the Study Area are contained in the *Water Quantity and Quality*, *Vegetation Resources*, and *Terrestrial Wildlife, T&E, Candidate, and Sensitive Species* sections of this chapter.

During the last 15 to 20 years, BLM and the Tribes have witnessed increased use of land, administered by BLM, by various groups, organizations, and individuals. Livestock grazing; recreation opportunities (e.g., hunting/fishing; oil, gas, geothermal, and mining exploration), along with relatively "newer" uses such as OHV use, mountain biking, equestrian, and interpretive trails are among many activities that are increasing within the BLM Elko Field Office administrative boundary. In addition, existing growth and development uses of public land, mineral exploration, and extraction continues to contribute to the general decline of sites and associated activities of a cultural, traditional, and spiritual nature.

Archaeological sites and artifacts, including tribal resources and sites of cultural, traditional, spiritual use and associated activities are increasingly in danger of losing their physical and spiritual integrity. Use of public land administered by BLM is commensurate with the growth in population and the potential for decline of culturally sensitive areas. Different world views and social and spiritual practices and beliefs often conflict with each other. Because the traditional land of the Western Shoshone encompass most of Nevada including the Elko BLM Field Office, BLM and affected Tribes must remain flexible and open to productive and proactive communication in order to assist each other in making decisions that will reduce or eliminate adverse affects to all parties and resources involved.

CHAPTER 4

CONSULTATION, COORDINATION, AND PARTICIPATION

PUBLIC PARTICIPATION SUMMARY

Public participation specific to this Draft SEIS is summarized in this chapter. The summary indicates how the public has been involved, identifies persons and organizations contacted for feedback, and identifies the process BLM used in accomplishing goals in accordance with 40 CFR 1506.6.

Public involvement in the SEIS process includes the steps necessary to identify and address public concerns and needs. The public involvement process assists agencies in: (1) broadening the information base for decision making; (2) informing the public about Proposed Actions and potential long-term impacts that could result from the Projects; and (3) ensuring that public needs are understood by the agencies.

Opportunities for public participation in preparation of this Draft SEIS are provided at four specific points:

- **Scoping:** The public was provided a 21-day scoping period to disclose potential issues and concerns associated with cumulative effects of the SOAPA Project. Information obtained by the agencies during public scoping was combined with issues identified by the agencies, and this forms the scope of the Draft SEIS.
- **Draft SEIS Review:** A 60-day Draft SEIS review period is initiated by publication of Notice of Availability for the Draft SEIS in the Federal Register.
- **Final Supplemental EIS/Record of Decision:** 30 days after publication of a Notice of Availability for the Final SEIS in the Federal Register, a Record of Decision (ROD) will be issued by the BLM.

IMPLEMENTATION

The public participation process for this Draft SEIS is comprised of the following four components:

1. PUBLIC SCOPING PERIOD AND MEETINGS

BLM filed a Notice of Intent (NOI) to prepare a Draft SEIS for the SOAPA Project to update cumulative effects analysis. The NOI appeared in the Federal Register on March 7, 2007 (Volume 72, No. 44, page 10241). The NOI announced a 21-day public comment period ending March 29, 2007.

Scoping letters were mailed to individuals and organizations announcing the scoping period and describing the cumulative effects analysis process. Issues regarding the cumulative effects analysis identified by BLM also were included in the mailing.

Scoping comments were received from seven individuals and organizations. Concurrent with these actions, BLM issued a news release to local news organizations and radio stations with coverage in the surrounding geographical regions.

2. DISTRIBUTION OF DRAFT SEIS

This Draft SEIS was distributed as follows:

- A Notice of Availability was published in the Federal Register on August 31, 2007 specifying dates for the 60-day public comment period which ends October 31, 2007.
- A news release provided to all area media by BLM at the beginning of the 60-day comment period on the Draft SEIS.
- Draft EIS was distributed to interested parties that responded to a request from BLM Elko Field Office during the scoping announcement.
- Draft SEIS was posted on the BLM website.

3. DISTRIBUTION OF FINAL SEIS

The Final SEIS will be distributed as follows:

- Notice of Availability will be published in the Federal Register.
- Copies of the Final SEIS will be sent to addresses on the Elko Field Office mailing list.
- Final SEIS will be posted on the BLM website.
- A news release issued to the same news outlets used for previous project announcements.

4. RECORD OF DECISION

A ROD will be distributed by BLM to individuals and organizations identified on the updated Project mailing list. A news release will be provided to the news media.

CRITERIA AND METHODS BY WHICH PUBLIC INPUT IS EVALUATED

Comments received by BLM on the Draft SEIS will be reviewed and evaluated by the agency to determine if information provided in the comments would require a formal response or contains new data that may identify deficiencies in the Draft SEIS. Revisions will be made in the Final SEIS to address substantive comments received during the 60-day public comment period, as appropriate. In addition, the Final SEIS will contain a *Response to Comments*. This section provides responses to comments BLM received on the Draft SEIS.

CONSULTATION WITH OTHERS

The following state and federal agencies were consulted during preparation of the Draft SEIS:

- Nevada Department of Conservation and Natural Resources
- Nevada Department of Human Resources
- Nevada State Clearinghouse

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Carlin City Mayor

City of Wells

Elko City Planning Board

Elko County Commission

Eureka County Commissioners

Elko Public Land Use Planning Commission
Natural Resources Library
Department of Interior

Library of Congress

Great Basin College Library

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National Park Service
(2310)

US Geological Survey

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CHAPTER 5

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